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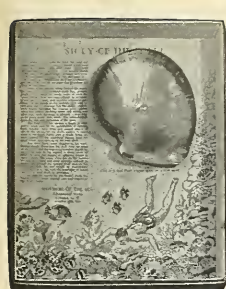
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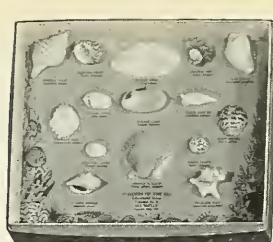
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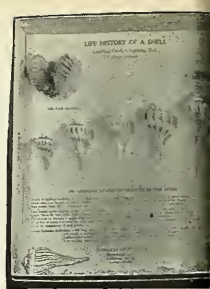
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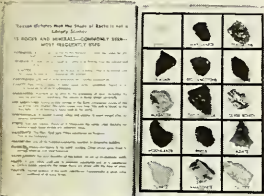


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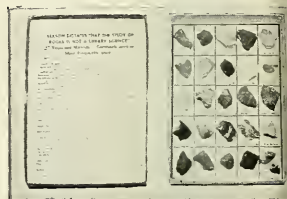
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LETTERS

An Astonishing Cloud

The remarkable sky display shown in the photograph above represents what is known as a roll cloud, we are informed by Harry Wexler, Chief of the Scientific Services Division of the U. S. Weather Bureau. It was photographed just north of Independence, California, by [Bob Bishop]. Mr. Wexler explains that waves and vortices are formed in the air stream flowing over the Sierra Nevada Mountains much as ripples and eddies are formed in a shallow stream flowing over a rocky bed. What is called the Sierra Wave produced this one.

Clouds are often formed in the upward moving portions of the waves. Occasionally, as shown in this photograph, streamers of cloud are drawn out of the parent body by eddies of smaller scale to form many fantastic shapes. These cloud streamers usually evaporate into

the surrounding drier air in a matter of minutes, and the formation is very unstable.

Cloud formations of this type, but not always so spectacular, are common to all mountain regions but are particularly well developed in the region shown here. The altitude record for sailplane flight, 44,000 feet, was established near Independence, California, by virtue of the up-drafts associated with the same type of phenomenon that led to this cloud formation.

One for All

SIRS:

Have you considered the hard case of the honeybee? While other stinging insects can sting and live to go on stinging, the honeybee's first effort in this direction costs it its life. Has any theory been advanced in explanation of this seemingly unfair discrimination in the insect world? What condition in the evolution of the honeybee can have brought about the addition of barbs to its stinger, which cause the stinger to be torn out of the bee's body? Do they serve, or have they

ever served, any good purpose in the life of the insect?

CHARLES W. CARTER, M.D.
Brookfield Center, Conn.

The following remarks are offered by Herbert F. Schwarz of the American Museum's Department of Insects and Spiders:

Dr. Carter's perplexity is understandable and challenging. Throughout living organisms, self-preservation is deeply implanted in the individual as a fundamental urge. Yet in the case of the honeybee, nature has circumvented the impulse to survive by craftily equipping the worker of this insect with a defensive device that, if used against vertebrate enemies, results (almost always) in the death of the worker herself.

The seeming anomaly loses some of its baffling character, however, if we think of the honeybee not as an organism independent of the colony but as a subordinate unit of a larger and interdepen-

Continued on page 46

LETTERS *Bob Symons of
Bishop, Calif.



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Edward M. Weyer, Jr., *Editor*

January, 1953

Volume LXII, No. 1



THE COVER THIS MONTH

The Indian girl on this month's cover belongs to the Cuna tribe, otherwise known as the San Blas Indians of Panama. She has recently been initiated into womanhood in a ceremony that required her to be continually showered with sea water for four days, except at night. The ceremony is described in an illustrated article beginning on page 8 of this issue.

The home of these Indians is off the northeast coast of Panama in the San Blas or Mulatas Archipelago, which comprises some 332 islands. The San Blas Indians belong to the now almost vanished Carib stock. Reports of White Indians among these people have arisen from cases of pronounced hereditary albinism.

These Indians have been in contact with Europeans since the sixteenth century, but they have clung to their traditional ways despite increasing pressure from without. Most of the men of the tribe work at one time or another in Panama, but they prefer to keep their own culture and language.

The color transparency from which the cover was reproduced was taken by Kurt Severin.

San Blas Indian Girl.....Cover Design

From a color photograph by Kurt Severin

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*You will find NATURAL HISTORY indexed in Readers' Guide
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YOUR NEW BOOKS

Edwin Way Teale's Nature Anthology • Astronomy
Francesca La Monte: Marine Game Fishes • Tibet

GREEN TREASURY

----- by Edwin Way Teale

Dodd, Mead and Co., \$5.00, 615 pp.

THIS is an anthology, a collection of passages dealing with nature selected from the works of 87 authors. The subtitle describes it as a journey through the world's great nature writing. Mr. Teale has provided an introduction and supplied comments throughout the text, which are very helpful in interpreting the particular author being read.

The subject matter is arranged under broad headings, which cover fundamental aspects of nature such as "The Waters," "The Land," "The Life of the Earth: Plants," and so forth. A period of 22 centuries is covered from the time of the earliest passage to that of the latest, which is taken from contemporary publications.

The editor of any anthology can always expect readers who may wonder at the reasoning back of some of the selections. *Green Treasury* conforms to the pattern of all good anthologies in that it contains a great deal of writing upon which well-informed opinion will be unanimous, namely, that the samples constitute the finest writing on nature known to modern man. The list of authors represented include the obvious and others not so widely recognized as classical writers of natural history. There is one significant distinction noted between the two patterns of writing selected by Teale that has puzzled this reviewer somewhat.

Most of the authors write from personal observation, their product is factual. Certain of the selections are from novelists or historians who may or may not be describing actual personal observations. Two schools of thought exist, one deals with nature as it was, the other with nature as it may have been. There is a touching significance in the fact that the partially blind historian Prescott never saw Peru; his impressions of Rain Forests (page 116) rested upon the descriptions of others.

Inspection of the index of authors gives an interesting light on Teale's selection. Eight selections are from W. H. Hudson, seven from John Burroughs, six from Thomas Hardy, one from Alexander Von Humboldt, and so forth.

HAROLD E. ANTHONY

MARINE GAME FISHES OF THE WORLD

----- by Francesca LaMonte

Doubleday & Co., \$3.50, 190 pp.,
147 illus. (80 in color)

WHERE can Bonefish be caught and when do they bite? How do you fish for Black Marlin? What are the accommodations for game fishing in the Seychelles? How can you tell a Fluke from a Flounder? Is a Barracouta the same as a Barracuda? The answers to these questions, and to hundreds more like them, are to be found in this book.

Year after year fishermen have cried for a handbook covering the game fishes of the seven seas, but up to now no one has had the knowledge or courage to tackle the job. As Secretary of the International Game Fish Association, Francesca LaMonte has had unique opportunities to gather and correlate data on fishing methods and conditions all over the world. To this she has added her own personal experiences, gained on extensive travel, and a thorough knowledge of the intricacies and pitfalls of fish identification. For Miss LaMonte is a professional ichthyologist, Associate Curator of Fishes at the American Museum of Natural History, and the acknowledged expert on the taxonomy of Marlins and their allies.

Following the plan and format so successfully used in the author's earlier handbook, *North American Game Fishes*,

this volume treats in synoptic fashion nearly 250 different marine game fishes. Under each are included sections on common names, geographical distribution, distinguishing characters and colors, size, habits, food, angling methods, and commercial importance, if any. Of great help in identification are the numerous, well-executed illustrations. A special section is devoted to a world-wide geographical résumé of angling conditions and the availability of guides, boats, and gear for anglers. A table of the I.C.F.A. record catches is given. Rarely has so much information ever been made available in so compact yet completely accessible a form.

JAMES W. ATZ

SECRET TIBET

----- by Fosco Maraini

Viking Press, \$6.50, 306 pp., 60 illus.

IN his attempt to tell the true secret of Tibet, Fosco Maraini, the author, has been eminently successful, for the people about whom he writes are primarily irresponsible, full-blooded human beings, and secondarily Tibetans. Each one in turn: sage, mystic, fop, opportunist, stately matron, waggish host or high-born flirt comes alive on page after page. Every bit of dialogue and every word picture rings true. He has caught the real feel of the land, and his lines are haunted by the echoes of authentic speech. I found myself answering and commenting with Tibetan phrase and quip as I read.

The writer makes no claim, either explicitly or implicitly, to profundity, but he is carefully accurate with a nice discernment of both inner and outer truth. With a fine sense of proportion he touches on almost every aspect of Tibetan life. Even when he discusses matters wherein his experience was quite scanty, such as details of nomad life and character, what he does tell is authentically Tibetan.

The most distinctive characteristic of the book is the flawless sense of proportion that governed its making. Though he senses them all, this traveler never lets smoke, dirt, and smell shut him away from beauty, nobility, or wisdom—both earthy and philosophic. Nor, on the other hand, does he accept idealized preconceptions for reality. Those avid for the telling of tall tales will be disap-



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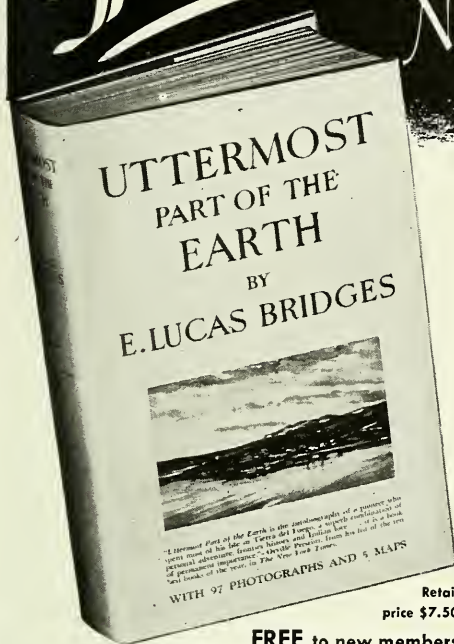
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pointed, but this is better than a tall tale.

In the first chapters of the book, with both wisdom and candor, the writer lets us see the known and the half-known through his eyes and humor, and we have a basis on which to evaluate correctly his later picture of Tibet and its people. The illustrations too, give more of the spirit, beauty, and haunting strangeness of towers, temples, or a Tibetan face against the great snow mountains than anything I have seen since some of Nicholas Roerich's paintings.

ROBERT B. EKVALL

HANDBOOK OF TURTLES

The Turtles of the United States, Canada, and Baja California

----- by Archie Carr

Comstock Publishing Associates,
Cornell University Press, \$7.50
557 pp., 82 photographic plates
and 37 line drawings

DR. ARCHIE CARR of the University of Florida has spent a goodly part of his life studying turtles, mostly in their native habitats. Carr's quest for knowledge of these shelled reptiles has brought him many rich and varied experiences, as well as an intimate knowledge of turtles, and has eminently qualified him for the writing of this book. The *Handbook of Turtles* is the highly commendable result of these studies. It is a pleasant blend of scientific information on turtle lore and entertainingly written accounts of personal anecdotes with turtles.

Like its predecessors in the series of excellent handbooks put out by the Comstock Publishing Associates, the *Handbook of Turtles* includes "keys" for identification, descriptions, life history accounts, and photographs of each of the forms that inhabit the region under consideration. In addition, there are general sections on the biological functions of turtles as a group, their place in folklore, and their economic importance. A full bibliography is given at the end of the book for those desiring further source ma-

terial. For ease in locating references to a particular geographical region, the more important publications are listed for each state and province in the area considered.

There are 79 species and subspecies of turtles occurring within the geographical limits covered by the book. This is approximately one-third of the estimated number of turtles living in the world today. A number of changes in both scientific and common names will be found in the book. Most of these changes result from an increased use of the trinomial designation for forms previously treated as species, but a few name shifts have occurred. A revised system of nomenclature is introduced here to replace the confusingly similar terminology used for the bones and the outer horny plates of the turtle shell. This proposal has considerable merit and should prove valuable in affording increased clarity.

It seems inevitable in a book of this scope that some errors or inaccuracies should be present. Happily they are very few in number and minor in importance. The *Handbook of Turtles* fills a large gap in the recently published accounts of our American reptiles. It is certain to be welcomed warmly by both amateur turtle enthusiasts and professional herpetologists.

JAMES A. OLIVER

SPORTSMAN'S COUNTRY

----- by Donald Culross Peattie

Houghton Mifflin Co., \$3.00
180 pp., 12 illus.

THIS series of twelve essays describes types of country of particular interest to sportsmen. Each article is identified with an animal dear to sportsmen. "Sportsman" has a broad application in this book and includes the gun-carrying hunter and the rod-bearing fisherman, the naturalist, nature lover and person of no particular ulterior motive beyond an appreciation of wide-open spaces. The author is a naturalist; he does not kill the creatures he observes but has no quarrel with the law-abiding hunter or fisherman. Peattie enjoys watching animals at home, and this book stresses the principles of ecology.

Let no one be disturbed by fancied involvement in the term ecology. The text has a simple, often lyrical style, and the reader is entertained. He meets the bobwhite, for example, in an introduction,

which includes its different names in various regions and its preferred haunts. Then the reader is ready to saunter over good "Bobwhite Country." On this walk he learns of the various calls made by bobwhite, its signature call, alarm call, rally, and numerous facts of life history. The bird harmonizes well with its environment. If the reader is an old friend of bobwhite, he can relive in Peattie's text the tang of an autumn morning, the exhilarating expectation of a covey rise, and the ever surprising explosion when the covey erupts in full flight. The cool drink from the clear spring, the crisp apples from the abandoned orchard, even the burrs brought back clinging to the trousers are inseparable memories.

No matter where the reader has lived, some one or more of these classified areas will fall within his experience if he has enjoyed the out-of-doors. This book is recommended to one who wishes to meet intimately for the first time the principal star in each act. For the person who has already met the star, the book will be the nostalgic reagent to set off countless pleasant memories.

HAROLD E. ANTHONY

PICTORIAL ASTRONOMY

----- by Dinsmore Alter and
Clarence H. Clemshaw

Thomas Y. Crowell, \$4.50
296 pp., 64 illus.

ALTER and Clemshaw, in *Pictorial Astronomy*, capitalize on the beauty of the skies by carrying the visual appeal into their book. It is a pleasant and rewarding experience merely to thumb through the pages and glance at this carefully selected array of astronomical photography at its best.

Yet this is far more than a picture book. Astronomy is here removed from the mathematical cobwebs and presented in a popular fashion in which no authenticity or reliability is lost. Every discussion is carried through logically and completely. The descriptive material on the earth's motions is especially good, reflecting patience and understanding animated by years of planetarium experience.

This is a book for everyone. The novel.
Continued on page 48

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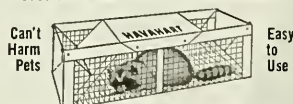
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◀ A YOUNG WOMAN who went through the rites a few years before seems to find more pleasure in the prospect of this fiesta than she experienced when it was her big day

➤ THE CHIEFS and lesser citizens of the tribe held council for two days over the author's request to photograph the ceremony. All the men of the settlement were invited to participate in this important decision. Their favorable vote was probably due in large measure to dental services the author and his wife helped to get for the natives through the offices of a visiting Danish dentist who accompanied them



Indian girl comes of age

Unprecedented portrayal of the puberty ceremony
performed by the aloof Cunas of Panama

By KURT SEVERIN

MANY journeys in out-of-the-way parts of Central and South America convince me that it would be hard to find any so-called primitive people so close to civilization and yet so reluctant to accept it as the Cunas, or San Blas Indians as they are called.

You can reach them in one hour by air from Panama City. They are close to one of the greatest technical wonders of our times—the Panama Canal, and practically all the men of this tribe work in Panama or the Canal Zone at one time or another in their youth. Yet they refuse to take many of the advantages (if we can call them that) of civilization. They intend to keep their own language and prefer their own way of life, despite the inevitable influences that contact with civilization has brought. They dislike outsiders on their islands and allow white residents on only about three of them. One of these is the Governor's seat, and the other two have

➤ AS SOON AS a father announces that his daughter is about to come of age, preparations begin. The girl is specially adorned. Note how this string of beads forms a design when wound around her ankle





▲ A PRIMITIVE but very ingenious machine is used for the extraction of sugar from which to make *chicha*, the fermented beverage that is drunk during the ceremony. The girl on the end of the pole jumps up and down, balancing herself with the stick, while the women feed the twisted sugar cane through the press

▼ A "BUCKET-BRIGADE" of girls carries water to the hut-within-a-hut for the purification of the maiden—a dominant feature of the ceremony. Note the albino with blond hair, a frequent sight among these Indians



▲ WHILE WATER is poured over the girl, others must keep out of the hut, but they may peek through the walls



settlements of Catholic and Protestant missionaries.

To stay on any of the other islands overnight or any length of time is not only against the Cuna rules but is actually a dangerous undertaking. To participate in, or take photographs of, some of the ceremonies is taboo. I had long wanted

to secure pictures of a celebration that is among the most difficult to photograph—the puberty ceremony of the Cunas. It is considered their most important and elaborate fiesta, and except for four photographs reproduced in D. B. Stout's scientific monograph, I know of no other pictures of this ceremony.

Various persons who claimed to have special knowledge of the Cunas tried to discourage me from attempting this. They said it would be dangerous, impossible. Differences in their accounts of the rites themselves made me doubt some of their stories. All of these "experts" had one thing in common: none of them could show a single photograph of the ceremony. I now doubt whether any of them had seen the whole thing.

I had been on the San Blas Islands on several occasions. The last time was shortly before World War II, when I made a study of the high frequency of albinism among these Indians, which I hope helped to give the truth behind the fanciful stories of the "white Indians" of San Blas.

The islands had meanwhile seen an influx of American Army and Navy personnel and even tourists, and daily plane service had been established between Panama City



◀ FOR FROM FOUR TO SIX days water is poured over the girl continuously, except during the night. She never leaves the little cubicle made of leaves inside the seclusion-hut within her father's house

▼ HOUR AFTER HOUR the girl is showered with ocean water drawn from a canoe kept filled inside the house





◀ HERE one of the two men chosen to get the genipa fruit for painting the girl is receiving special treatment with a ceremonial cigar almost a foot long. One man places the lighted end in his mouth and blows in such a manner that the smoke passes over the other

▲ THE genipa-fruit team comes back from the mainland with material for coloring the girl's body. The boy carries an incense burner. A gun is fired from the mainland to announce the return of the two, because no one is allowed to follow them. If someone does, the girl's future babies may have moles

and a number of places. But when I returned to the islands recently, I found no change in the Cuna's attitude toward the outside world.

To stay on any of the "permissible" islands, it is almost essential to have some sort of official contact, and the Panamanian Governor of the San Blas Indians had kindly offered his headquarters on Porvenir as a base. However, with elections close, this might prove a bad spot from which to get the confidence of the Indians. I could also have availed myself of an invitation from the priests at Nargana to come to their islands. But I felt that within the neighborhood of their teaching, my effort to secure an unchanged native ceremony would be hindered. I thought then of my old friends from years

before, but heaven only knew where they were at this time, possibly scattered. So I finally decided to fly to Ailigandi, where Alcibiades Inglesias, a full-blooded Cuna, headed a school and non-Catholic mission. Alcibiades is a graduate of the University of Dubuque in Iowa and is married to an American woman. According to what I had heard, he was a friendly and helpful man. Perhaps he would be the one to establish contact for me with the natives.

I found him quite helpful and friendly but only to a certain point. His position as part of the "Big World" is not quite clear. It seems to me that his school and missionary work are far more tolerated than welcomed.

I took along two "live assets": my

wife and a Danish dentist. Both were instrumental in making friends with the Cunas during the days of waiting. Mrs. Severin had proved on many earlier occasions that the presence of the explorer's wife will create confidence and eliminate the fear of sexual complications that may be created by the visit of a white man alone. In fact, much of my picture work with natives in earlier years was obtainable only with the help of Mrs. Severin, who has a way of getting along with everyone, even without knowing the language. The dentist had been waiting between boats at Panama and was glad to take part. He and my wife pulled teeth for two days with only essential tools and medications at hand. It helped greatly to create a friendly atmosphere.



▲ BEFORE THE MOTHER extracts the genipa-fruit juice for the painting of the body, she looks at the seeds. Their arrangement is sometimes used for divining the girl's past conduct and telling her fortune

Mr. Inglesias introduced me to the local Chiefs and the local Congress, and I waited for hours and hours while heavy disputes over my request were carried on. Of course, I did not understand a word of it, but their glances made it plain that I was the center of the discussion.

Finally Mr. Inglesias explained that the Cunas wanted to know what I really was after and why I wanted the pictures. I stated that I had come to make a report of their greatest fiesta, which had been distorted by occasional travelers.

Their reasoning in the end was quite surprising. All they wanted to know was whether I intended to sell my pictures as postal cards in Panama. If I was simply to report the true series of events, and if I was ready to contribute to the funds

for the big *chicha*—the important alcoholic part of the ceremony—they would not be too concerned.

After I had assured the council that I would not sell any postal cards in Panama and that I was willing to carry out my plan under their terms, I was given permission and told to wait for the next girl to reach puberty.

After a few days of waiting, we were told that all was ready and the party began. The pictures show what happened. The great difficulty was to keep up with the events, which followed so fast that I could scarcely find out what was going on. Without my wife's help and Inglesias' interpretation, I would have had to give up. Incidentally, Inglesias is very much opposed to the ceremony, because as the prophet

▼ THE GIRL'S SKIN is darkened several shades by rubbing the blue-black juice of the genipa fruit on her body





▲ SHORTLY BEFORE the cutting of her hair, the girl listens to instructions from one of the elders. In a few minutes her hair will be bobbed and she will be considered grown up and ready for marriage

of progress, he feels it is his job to bring his landsmen away from this conglomeration of taboos, superstition, and primitive behavior.

This ceremony, as I say, is the most important fiesta for the Cunas, and it emphasizes the superior esteem in which these people hold a woman. A girl among the Cunas is always an asset. She represents an important working factor in the house, and by marrying she also brings a husband into her family, thus increasing the clan by a new member and provider. The birth of a girl baby is a joyful event, and her attainment of maturity, with marriage presumably in the offing, calls for their biggest celebration.

First, the father announces to the council that his daughter is coming of age. A conk horn blows the news all over town, and the men gather to take orders for the arrangement of the fiesta. Groups are formed in the council house for the carrying out of certain tasks.

There is, for instance, the building of the hut within the hut of the girl's father. It is made of palm leaves brought from the mainland. Within this, another cubicle is built

just about the size to seat the girl.

Another group arranges for the making of special big cigars. These have a ceremonial purpose. They are used for blowing smoke in a certain fashion over the men who go to the mainland to procure the pigment material for coloring the girl, the so-called genipa-seekers. It comes from the lemon-like fruit of the genipa tree, which is mashed into a bluish-black juice.

However, the center of activities is the double seclusion hut within the father's house. Here sits our little girl awaiting purification and preparation for her future task as a wife and a mother. Her ordeal is not an easy one. For from four to six days, water is continuously poured over her, except during the night, when the poor shivering child is placed in blankets to fight the inevitable cold. A gang of girls is busy all day long bringing the water from the ocean to the house, where it is poured into a canoe that is inside the outer house. Two girls at a time do the job of splashing the water over the victim.

It is at the end of the fourth day, if that is judged to be enough, that

the genipa-fruit boys go out to gather the fruit. The paint is prepared, and the now adequately "cleansed" girl is painted quite a few shades darker than her clanspeople. Her skin is now of a bluish-black color.

As the final act, her hair is cut short by her mother. With this act, she accepts the appearance and obligations of a young woman and must behave like one from then on. She is no longer a child who will play in the streets of the island. She is eligible for marriage and will soon make the choice of a husband. However, the father actually has the final word in this matter, and it all boils down to a family contract.

The great drinking bout will be in progress during the last day and may go on longer. In our case this made the picture-taking more and more unpleasant and difficult. The



▲ HER LOCKS are trimmed, in the final important act of the ceremony, signifying her attainment of maturity

situation was complicated by the fact that the puberty rites overlapped a little-known annual event: the "San Blas Revolution Day." This commemorates the anniversary of the uprising of 1923, which was instigated by an American, Richard Oglesby Marsh. A couple of hundred Panamanian citizens were massacred on this occasion by the Cunus, who fought for their threatened independence; and an American warship had to intervene. Marsh, who was also responsible for the legend of the white Indians of San Blas, was forced to go back to the United States.

This celebration included a pantomimic rehash of the historic events by all the old warriors and chiefs. It was staged on the big ceremonial ground, and our girl,

now "confirmed" and able to take part in public affairs, served as one of the maidens of honor.

Mr. Marsh is still considered a national hero among the natives of Ailigandi, where some of the battles took place. He appeared on the scene, impersonated by one of the fairly numerous albinos that can be seen among these people—certainly an unusual method of dispensing with make-up.

As the two interwoven fiestas reached the "boiling point," picture-taking became impossible. The alcohol drowned most of the agreements we had made with the Cunus in more sober moments, and a hazardous situation developed. The Indians became abusive—even the wives, who remained sober but had a hard time getting their husbands



▲ NOW SHE is allowed a harmless flirtation with a boy of her own marriageable age



▲ SHORTLY THEREAFTER, the boy takes her home to ask her father to let him marry her. The father has the last say in this matter, and if the boy is accepted, an agreement resembling a business contract will develop

home in one piece. Everybody began to take it out on us, blaming our presence for the "extra work," and it became clear that it was high time to leave—with our cameras and films still intact.



Giant Goldfish

Your dainty pets can become
the bane of the outdoor waters

By CHARLES L. CADIEUX

▲ ONE of the "overgrown" goldfish being displayed by Dale Henegar, Manager of the Fisheries Division of the North Dakota Game and Fish Department

MANY amateur goldfish fanciers have been disappointed by the way their pets have grown when placed in an outdoor pool for the summer. The diminutive ornamentals are members of the carp family, reduced in size by selective breeding. If they are given unlimited food and room to expand, they get back some of the size that selective breeding has taken away from them.

Amor Dam, favorite fishing spot of the dry Badlands of southwestern North Dakota, was the scene of a large-scale example of this process.

A local merchant, disgusted with the slow sale of his bargain goldfish, dumped the whole lot into Amor reservoir. Nothing was heard of them for several years. Then reports began coming in of giant goldfish showing up in the shallows. The take of bass and crappies in the lake became smaller each year. Fishermen blamed it on the in-

creased turbidity of the water. They were right. The goldfish is a bottom feeder. He takes in small bites of the bottom ooze, strains the food particles out, and then expels the silt with a puff of water. He works the entire lake bottom like an aquatic vacuum cleaner, steadily adding to the amount of suspended solids in the water.

In their fourth year, the goldfish had increased in numbers to the point where they had muddied the waters enough to halt reproduction of all other species. There are three possible reasons for this: (1) The goldfish ate the eggs or young fish, (2) they covered the eggs with silt, preventing a hatch, or (3) the lack of light in the muddy waters inhibited spawning.

The effect of decreased sunlight on fish reproduction has never been ascertained. However, considerable credence is lent to the third alternative by the fact that many goldfish were found to have retained

their eggs as late as September. This egg retention caused bloating. Some specimens had bellies distended so badly that the scales stood out at right angles to the body.

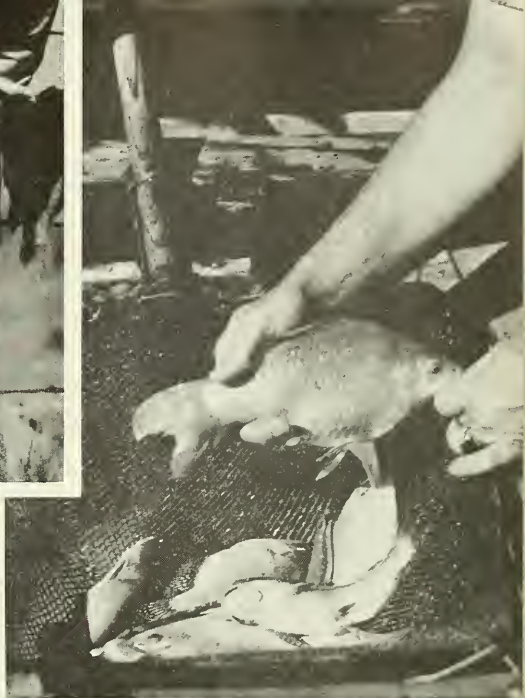
North Dakota Game and Fish Department test crews found that the goldfish had attained an average size of ten inches, with individuals weighing as much as a pound and a half. Besides the goldfish, seiners recovered large-mouth black bass, black crappies, bullheads, and a few common suckers. There were no young fish of any species! Sedimentation tests showed that the dissolved solids in Amor ran as high as 440 parts per million. Truly, this water was almost too thick to pour and too thin to plow!

As game-fish production was at a standstill, the Fisheries Division decided to remove all fish life and then restock. More serious even than the value of the reservoir to the fisherman was the danger of



▲ THE GOLDFISH HALTED reproduction among all other fish. They even retained their own eggs as late as September, possibly as a result of muddiness and scarcity of sunlight. Some had their bellies so distended that the scales stood out at right angles

➤ WITHIN ABOUT FOUR YEARS, the goldfish in the reservoir had attained an average size of ten inches and weighed as much as a pound and a half



spreading the goldfish throughout the entire drainage of the Missouri River, into which these waters eventually flow.

After careful mapping and sounding to determine dosage, the reservoir was treated with Fish-Tox, a commercial preparation with rotenone as one of its ingredients. Killing action is accomplished by chemical constriction of the capillaries supplying the gill filaments. Suffocation results. It affects no other forms of life but is final for gill-breathers.

Although the tests had established the fact that there was a large population of goldfish, no one was prepared for the sight that met their eyes. In their dying throes, thousands of the fish came to the surface, flurried wildly for a few seconds, and then sank back into the chocolate-colored water. At times the entire surface of the lake seemed to be on fire.

Almost every possible color com-



▲ THE DECLINE of all other fish in the dam necessitated elimination of the giant goldfish. Poison brought thousands to the surface, and at times the water seemed to be on fire

bination was present, ranging from violent brick-orange to pale saffron. Some fish had lost most of their color and were a pearly, almost translucent white.

Test cages, holding all different species of fish, were suspended at


different levels. Checking of these cages showed that all fish life had been killed. Twenty days later, all toxicity had disappeared. The muddy waters had cleared and desirable species of fish could again be introduced.

Nature's Footprints

in the snow

Some pointers on how to piece together the silent dramas of the woodlands to which the snow alone is witness

By HUGH WILMAR



▼ THE WINTER HIKER, trailing the cunning red fox early in the morning may never draw close enough to spy the animal. But if he not only *sees* but *observes*, as Sherlock Holmes urged Dr. Watson to do, his search will bring him into close communion with the animal world. He will know, for instance, that this fox was "loping," not walking, because its trail shows paired imprints rather than equally spaced ones

VANISHED creatures that strolled through the world 100 million years ago can be visualized today, thanks to the bones and tracks left in sand or mud and "turned to stone." These imperishable tracks ranging from tiny insect trails to enormous runways of animals weighing 30 tons, are constantly being discovered throughout the world. Nature's files also include the footprints and fingerprints of humans who died 4000 and more years before Scotland Yard.

The study of the tracks left by more or less mysterious animals millions of years ago is a fascinating but difficult job even for specially trained scientists. Not less fascinating but much easier is the study of tracks made by the creatures we have today. In fact, a great deal of our existing knowledge about wary and nocturnal animals has been obtained from nature's "fingerprints" left in mud, sand, or snow.

On the glistening virgin snow, each animal writes an autobiography during its nightly rounds. Printed in characteristic patterns, often beautiful in their simplicity, the winding strings of fragile imprints tell tales of a continuous struggle for life and love. Were it not for these records in the snow, we might imagine that the wild winterwoods were quite desolate. This open snow-book not only provides an animal inventory but





▲ **SIGNS OF AN OTTER** at play. The otter is one of the most playful animals of our wilderness. It will often take time out to slide down a steep slope, preferably into the water, and repeat the performance over and over for as long as an hour. This otter slide was fifteen yards long. Although partly thawed out, three distinct furrows can be seen. In the middle is the tail drag. On either side are the marks left by the legs, which were bent backward on the outside

➤ **PERHAPS** the most remarkable and effective method of travel among all short-legged animals is shown here. This otter was sliding in earnest, not for fun. The snow trail clearly shows that, after making several jumps, the otter repeatedly bent its legs backward and slid in a toboggan-like fashion, flat on its belly and breast. Each time, it would slide as far as the smoothness of the snow permitted, and it apparently prolonged the slide through muscular movements of the breast and belly. In this way, the otter can travel faster than a man can run on snowshoes, and it covers great distance on land during the winter in search of open water. In the locality shown, the animal continued its four jumps and a slide for over half a mile



◀ WHEN THE SNOW gets deeper than two inches, the mice have to travel beneath it. Note how feeding tunnels branch off in both directions from the main sub-snow highway. Such artistic patterns as these might well be produced by a single meadow mouse, blindly nosing its way through the snow



➤ THESE are pheasant and bobwhite tracks in a cattail marsh, where the birds find food and roosting cover during the winter. Apart from the obvious difference in size, the pheasant clearly registers a hind toe and walks in a straight and narrow line. The quail, however, toes-in and barely shows a hind toe in the tracks





◀ THIS LITTLE STUMP sticking out of the snow in a wood clearing aroused the curiosity of a fox squirrel and a coyote. The latter traveled from one stump to the next and deposited a few drops of urine on each of them. The squirrel barely changed its course for a short investigation



and developed these highly specialized feet.

When a four-footed animal walks or strolls, it usually puts its hind feet right into the imprints left by the front feet. Often the hind feet are somewhat larger, so they overlap the front prints and leave a simple zigzag pattern as we two-legged creatures do. However, if these animals start running, they leave the same design as the typical bounders such as rabbits, squirrels, and various mice. The hind legs often overhaul the front legs, so that their imprints are farther apart and placed in front of the forefeet.

If the bounding animals are types that live on the ground, such as rabbits, the prints of the forefeet are diagonally behind the hind feet. But if they are tree-dwellers, like squirrels or racoons, the front feet are usually paired together.

The body build of the animal is also evident in the tracks. It goes without saying that short-legged, clumsy creatures such as skunks, opossums, and shrews place their

shows the mutual relationships between animals and the plant community on which they are dependent.

Trying to understand this intricate biotic community by studying the tracks of nature's people of the night is an engrossing sport. The beginner will probably be confused when he looks at a complex tangle of tracks left on the fresh snow; but upon closer examination, it is easy to group the different track patterns into types. Even when the individual imprints are not clear-cut, it is possible to tell the general kind of animal.

Since each species of animal has

a bodily make-up suited to its habits and to the role it plays in the community, its footpads and its method of locomotion will likewise be different. Thus, the animal kingdom, can, in general, be broken down into "flatfoots," "toe-walkers," and "toe-tip walkers." Man himself belongs to the first group, walking on the flat of his feet, as do animals such as the bear, beaver, racoon, and weasel. The toe-walkers are animals like the dogs, foxes, wolves, and cats. The last group, the toe-tip walkers, embrace all the large hoofed animals which, in the process of evolution, have lost most of their toes

feet closer together and often have to wade belly-deep through the snow. Other animals like beavers, rats, and some mice register a characteristic tail-drag between their footprints.

Although most animals can be broadly classified by their general track pattern, a clear picture of a single imprint showing the toe pads and nail or claw marks may be necessary to narrow the identification down to the specific creature, and it is often impossible to

find that sort of print. It is usually best seen in the mud on dirt roads or along streams and creek bottoms. Otherwise it requires a light snowfall on the ground or on a frozen snow crust. A thaw is best, when the snow is packing, but one has to be on the trail before the sunbeams erase the clear-cut evidence.

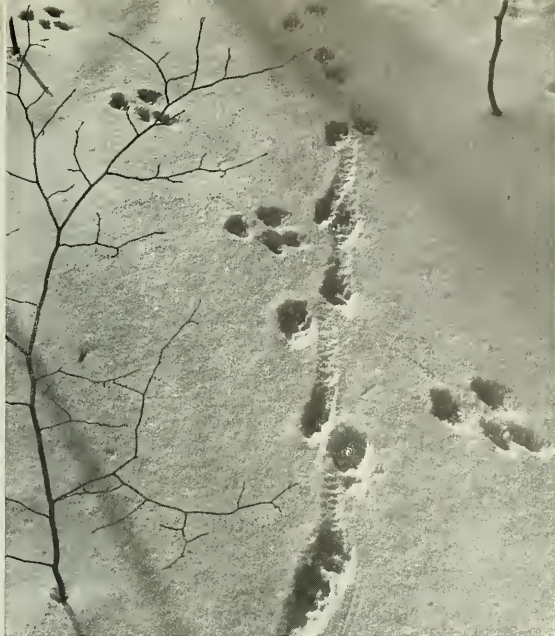
The identification of the maker of a track is a rewarding experience, but the true naturalist—amateur or professional—finds his

greatest satisfaction in following, like a Sherlock Holmes of the trail, the motives and passions—the hopes, fears, and achievements—of the members of the animal kingdom who wrote their life stories in the snow.

As Ernest Thomson Seton put it: "Never forget the trail; look ever for the track in the snow; it is the priceless, unimpeachable record of the creature's life and thought, in the oldest writing known on the earth."

▼ A SIMPLE PATTERN like this tells a dramatic story. Here a bird of prey swooped down on a mouse. The mouse had pushed up from under the snow, as similar mouse activity in the direct vicinity indicated. The relatively soft and rounded impression of the bird's primary wing feathers suggests that this bird was an owl. A more heavily built bird usually leaves the mark of the individual flight feathers when it takes off from the ground. Such a complete double wing cast is most often seen from crows and pheasants, even when there is only one inch of snow on the ground





▲ THE CLUMSY SHORT-LEGGED RACCOON proceeding toward the top of page left an untidy track pattern as it moved uphill. Usually the walking trail of this animal is more like that of other creatures. His running trail would more resemble that of the squirrel, since both are tree dwellers. Identification was corroborated in this case by trailing the animal up the hill and into a hollow branch 20 feet above the ground. "Ring tails," as they are often called, go into partial hibernation in the northern United States but come out to feed and to drink during warm spells

▲ FOLLOWING THIS PECULIAR TRAIL in both directions led to the solution of a night-time woodland murder. The broad and relatively large tracks labeled the mink as the aggressor. After killing a duck on the ice, the animal dragged its much heavier victim with little jerks for 100 yards along the lake shore. Mink hunt on the margins between land and water and compete with the otter for fish. Other members of the weasel family are its competitors for mice, rabbits, and birds. But the mink's special diet in winter is largely frogs and muskrats

➤ THIS interesting highway intersection in a clearing shows four different animals, each of which went its way. Enemy of all was the coyote, who crossed to the left. The irregularity of the doglike trail makes one suspect that the animal was slightly crippled and might have been in a trap previously. Next came the galloping flat-footed skunk, diagonally from bottom left. Obviously unaware of the past danger, a ruffed grouse on its "winter snowshoes" crossed in short strides. (A partly thawed grouse track far to the left might have belonged to the same bird, crossing the day before). And finally, a gray squirrel (right) represents its large family with its almost square track prints





Moulin photo from Save-The-Redwoods League

▲ LIKE the columns of a vast cathedral, the trunks of the redwoods rise through filtered sunlight in the Jedediah Smith State Park in extreme northwestern California



▲ A VIEW overlooking the Garden Club of America Grove. One of the methods of saving the redwoods from the saw-

mill is the privilege of setting aside memorial groves in the name of civic organizations or individuals.

Moulton Photo from Save the Redwoods Exhibit

Who Saved the Redwoods?

There was a surprise in store for a skeptical public who said these farsighted men had bitten off more giants than they could chew.

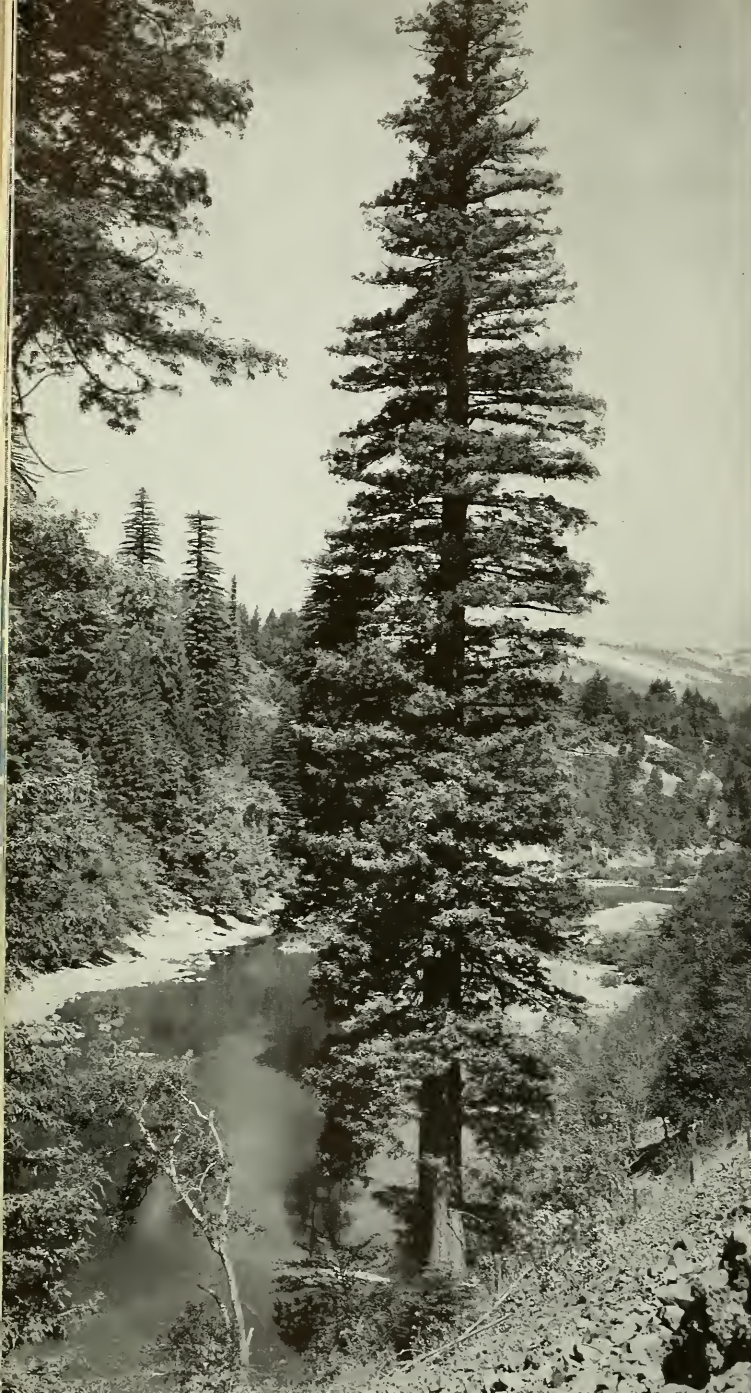
By WELDON F. HEALD

DRIVING up California's famed Redwood Highway one day, my wife and I stopped at the Whittemore Grove. In its center was a grand veteran redwood 15 feet in diameter, nearly 300 feet high, and probably 2000 years old. Here was a tree that started life about the time Caesar became consul of Rome and was 100 feet tall

and 2 feet in diameter when Christ was born.

As we circled the giant and discussed its amazing size and age, a car with Iowa license plates drove in and parked. A nice-looking, middle-aged couple got out. They walked around, breathed in deeply the fresh fragrance of the redwood forest, and looked up at the straight,

WHO SAVED THE REDWOODS?



Moulin photo from Save-The-Redwoods League

▲ A YOUNGSTER that would put most other trees to shame: a single redwood on the south fork of the Eel River in Humboldt County, California

clean, reddish-brown trunk of the great tree. Then the man turned to us.

"It's certainly a fine thing that somebody's doing something about saving these trees," he said.

"It sure is," we agreed, and the Iowa couple returned to their car and drove off.

That was all.

But behind these casual pleasantries between strangers is one of the outstanding conservation success stories in America. The "somebody" who is doing something about preserving these unique and irreplaceable trees for you and me is the Save-the-Redwoods League. The phenomenal growth and miraculous achievements of this organization are comparable in scope to our big industrial corporations, such as General Motors or United States Steel. But what makes the Save-the-Redwoods League story even more remarkable is that the profit motive is entirely lacking; the aims of the organization are purely unselfish, and its success is due to the voluntary co-operation and hard-earned dollars of the American people, from Bangor to San Diego.

In the 34 years of its existence,





H. C. Tibbitts photo from Save-the-Redwoods League

▲ THE TALL straight shafts of a redwood grove offer a sight seen nowhere else in nature. A scene in the Eel River region

the Save-the-Redwoods League has grown to a membership of 16,000. It has rescued 55,000 acres of the world's mightiest trees from certain destruction, at a cost of \$10,000,000, and has given the country the Redwood Highway, the most spectacular forest drive on earth. But perhaps more than anything else, the Save-the-Redwoods League has dramatized the idea that America belongs to the generations yet to come as much as it does to us. It has successfully sold the doctrine that some of our matchless natural heritage should be preserved to hand on unspoiled and unimpaired to our children and our children's children.

So today you can drive up the Pacific coast north from San Francisco on U. S. Highways 101 and 199 to the Oregon line and pass through more than 100 miles of magnificent primeval redwood groves. Among these towering trees the road becomes a deep, vaulted aisle between living trunks, ten to twenty feet in diameter. The gigantic redwoods interlace their feathery foliage 150 feet above the ground and filter an eerie, sun-shafted half-light into the glades below. Arrowy sword ferns, moss-

draped vine maples, azaleas, and rhododendrons grow beneath the trees, and a thick carpet of moss and delicate green oxalis is spread over the forest floor, covering every rock and fallen log. There are salmon in the rivers, little cascading brooks among the redwoods, and deer and elk make these forests their home.

In fact, nowhere else is there anything that quite compares with the Redwood Highway, and each year some two million people come from all parts of the country to enjoy and marvel at these enduring mammoth trees. The best of it is that the trees belong to all of us for as long as our civilization survives.

Had it not been for the Save-the-Redwoods League, in co-operation with the California State Park Commission, this superlative American highway would by now be an undistinguished road through a wasteland of enormous fire-blackened stumps.

However, the League's job is by no means done. It is vigorously planning campaigns to acquire the most scenic redwood groves remaining in private hands. It is to the interest of all of us that they be saved. Now is our one chance—we

shall never have another. The whine of always-hungry sawmills along the Redwood Highway is louder today than ever before.

Why are these trees so important? Because they are found nowhere else. When Nature dealt out her gifts, she endowed California with a number of extraordinary things. Even the climate is "unusual," as every visitor soon learns. But none of Nature's gratuitous donations to the Golden State is more startling than the two species of sequoias—the Redwood, world's tallest tree; and the Big Tree, largest and oldest living thing known. These are prodigies—even for California—and they seem to be trees of another age and dimension, obviously intended for a bigger and better planet than we humans deserve.

Sequoias are the venerable ancients of the vegetable kingdom. They thrived in vast forests 100 million years ago when the earth was dominated by 30-ton dinosaurs and fearsome flying reptiles. Some 45 species of fossil sequoias have been found in the rocks throughout the Northern Hemisphere. But slowly the mountains heaved, the seas came and went, the climates changed, and little by little the sequoias lost their hold, until today only the redwood and the big tree remain, the last living representatives of their giant, lusty race.

Most fittingly, these noble arboreal aborigines are named after Cherokee Indian Chief Sequoyah, who devised an alphabet for his people and is honored by a statue in the Capitol at Washington. They are cone-bearing trees whose closest North American relative is the Bald Cypress of our southern swamps, although a nearer kin, the Metasequoia, or Dawn Redwood, was discovered in central China six years ago.*

The redwood and big tree are brothers under the bark and have a general family resemblance, but each has a distinctive and individual personality of its own. They even prefer completely different

* See "Redwoods in China," by Ralph W. Chaney, in *Natural History* for December, 1946.



Moulton photos from Save-The Redwoods League

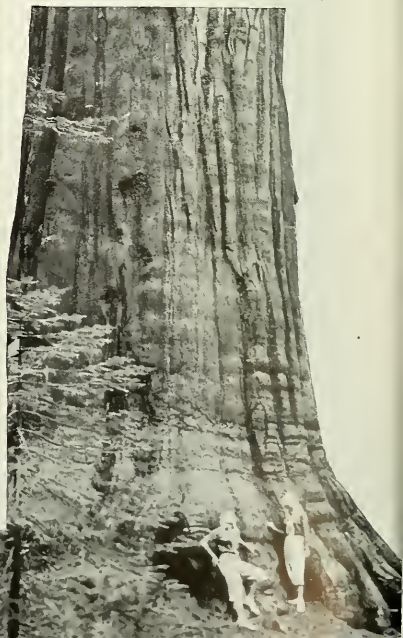
▲ **HOW BIG** the tree, how small the man! Some assorted giants which, thanks to conservation efforts, will be on earth long after many of our passing follies are forgotten

➤ **A MONARCH** of the South Calaveras Grove, California



surroundings and never mix in brotherly fashion. The redwood grows in a narrow, 500-mile belt bordering the mild, foggy coast of central and northern California into southern Oregon. It never climbs above an elevation of 3000 feet. The big tree, on the other hand, likes the spartan environment of winter cold and deep snows in the mountains and is found only in 70-odd scattered groves stretching for 240 miles along the west slope of California's lofty Sierra Nevada, from elevations of 3500 to 8500 feet.

Someday, to take your mind off taxes, wars, and presidential elections, pace off a distance of 36 feet on lawn or sidewalk. Or, if you have the space, measure a circle with a circumference of 101 feet. The first is the diameter, the latter the girth of the General Sherman Tree, patriarch of all sequoias. Then imagine it extending into the air 272 feet, equal to a 25-story hotel, and weighing 6172 tons, about the same as a good-sized ocean freighter. When you have digested these incredible figures and accepted its age at around 4000 years, you will be ready to believe that there is enough lumber in the General Sherman Tree to build 45 five-room bungalows or to construct a



box completely enclosing the liner "Queen Elizabeth"—if there were any reason for such a ridiculous undertaking.

The redwoods of the coast are supertrees, too, but they cannot compete in size and age with these mountain monsters. The biggest redwoods measure up to 23 feet in diameter, although the average is from 10 to 15 feet. Also, their life span of 1500 to 2000 years makes them youngsters compared with the big trees. But in height the redwood is supreme. The Founders Tree at Dyerville Flat, commemorating the three men who started the Save-the-Redwoods movement, towers 364 feet—the tallest accurately measured tree in the world.

There are other differences between these astonishing survivors of a bygone age. The big trees stand as ponderous individuals or in impressive groups among pines and firs. Their huge cinnamon trunks and enormous gnarled branches produce an effect of overpowering bulk and unchanging, ageless solidity. The redwoods grow close-ranked in massed twilight forests of almost tropical luxuriance. In spite of their size, they soar upward with grace, impressing one with a sense of enduring strength and serene, transcendent beauty. But both sequoias are notable for their eternal vigor as they live on through the centuries, stoutly defying the ravages of time, droughts, storms, pests, and fires.

So it is a toss-up which sequoia is the more remarkable tree. But not to the lumberman. He has never had any doubt about it. While the wood of the big tree is coarse and brittle, fit only for low-grade uses, such as grape stakes, the redwoods produce Grade A lumber which is growing in popularity throughout the country. This difference in the commercial usefulness between the two sequoias has resulted in 90 per cent of the big trees living peaceful, undisturbed lives in protected federal and state reservations, while most of the virgin redwoods are destined to succumb to ax and saw in another generation.

WHO SAVED THE REDWOODS?



Patterson photo from Save-The-Redwoods League

▲ ALL who see the redwoods carry away a lasting memory of the slanting shafts of light and the fragrance of the forest air

As long ago as World War I, prospects for saving any of the two million acres of grand climax redwood forest along California's north coast looked pretty dim. War needs had grown, and the annual cut was stepped up to meet them. At that time only about 11,000 acres of redwoods had protection under public

ownership, and they were in the southern part of the area around San Francisco. Few people had even heard of the majestic groves in what was then a little-known section of the state, for no railroad penetrated northwestern California until 1914, and what roads there were became impassable mud

tracks a good part of the year. The redwoods had friends, of course, but they were unorganized individuals who could not expect to do much more than stand with bowed heads, hats in hand, at the eventual funeral.

But one afternoon in the summer of 1917, four determined conservationists got together. They discussed the unhappy plight of the inimitable redwoods as they sat beneath the great trees of the Bohemian Grove on the Russian River, north of San Francisco, scene of the famous Bohemian Club's annual High Jinks. The men were: Madison Grant, President of the New York Zoological Society; Henry Fairfield Osborn, President of the American Museum of Natural History; John C. Merriam, Professor of Paleontology at the University of California and later President of the Carnegie Institute of Washington; and Horace M. Albright, Acting Director of the United States National Park Service and afterward Director from 1929 to 1933. These men decided the time had come to act—and fast.

They proposed a trip into the redwood country to learn firsthand what was going on. Albright was too busy with National Park business to take time off, but the other three made the pilgrimage and found conditions worse than they had imagined. Clear-cut logging operations were going full-tilt on all sides, and thousands of acres of giant redwoods were crashing to the ground. Uncontrolled fires ran through the slash, and a deep smoke pall hung over the devastated land. Grant, Osborn, and Merriam were appalled and rushed back to San Francisco with the light of crusaders in their eyes. That was the start of the national Save-the-Redwoods movement.

The three men spent a busy fall working on organization details and rounding up friends of the redwoods all over the country, wherever they could find them. Then they launched the Save-the-Redwoods League in 1918. Two definite goals were set. The state was plan-

ning to build a new major highway through the redwood region of northwestern California to the Oregon line, and the first objective of the League was to acquire as much virgin redwood acreage as possible along this road. The second was to preserve a large block of the finest forests in a Redwood National Park.

To a lot of people it looked as if the infant organization had tackled a David and Goliath proposition—with the League playing David. Such an ambitious program called for millions of dollars and endless man-hours of labor. Where was all this time and money coming from—particularly just to save some trees way out in the wilds of California? But the doubters did not realize the caliber of the men who undertook to stir the entire country with their Save-the-Redwoods crusade. Grant, Osborn, and Merriam had plenty of ammunition for their redwood slingshot, and they started firing it at Goliath immediately.

In fact, no trees ever had a finer set of defenders. Franklin K. Lane, Woodrow Wilson's Secretary of the Interior, was the Save-the-Redwoods League's first president until his death in 1921. Newton B. Drury took the hard-working job of administrative secretary, which he held until he became Director of the National Park Service in 1940. Other men who joined the organization were: Joseph D. Grant, First Chairman of the Executive Committee and later Chairman of the Board of Directors; and California Congressman William Kent, who had already presented the Government with Muir Woods, a fine 426-acre redwood grove ten miles north of San Francisco. The secretary-treasurer was Robert Gordon Sproul, now President of the University of California. Another public figure who always worked hard for the League was Stephen Tying Mather, dynamic and public-spirited borax millionaire, who, as head of the National Parks from 1915 to 1929, laid the foundations for the Park Service as we know it today.

The League's initial campaign was spearheaded with articles by

Samuel G. Blythe, Albert W. Atwood, and Joseph Hergesheimer in the *Saturday Evening Post* and with well-illustrated pieces by Osborn and Madison Grant in the *National Geographic Magazine*. This was a dramatic curtain-raiser that introduced the young organization to a large cross section of the country and put these big-circulation magazines squarely behind the Save-the-Redwoods movement. Memberships began to pour in, and influential *Post*-editor George Horace Lorimer became a League councilor, as did the *Geographic's* Gilbert Grosvenor. The latter still serves today.

Hundreds of enthusiastic volunteers knuckled down to the thankless spadework without thought of fame or recompense, and thousands of Americans were so stirred by the story of the beleaguered redwood giants that they whipped out their wallets and checkbooks for the cause. William Kent and Stephen Mather chipped in \$15,000 apiece; two others contributed \$12,000 each; and the people of Humboldt County, in the heart of the redwood belt, raised \$55,000. In the first three years, the League collected 5000 members, gained nation-wide support from outdoor clubs and a bewildering assortment of organizations, and bought three groves along the new highway, which were deeded to the State as parks.

A happy note, from the beginning to the present day, has been the mutual good will between the crusading conservationists and the redwood lumber companies. The former always recognized that the bulk of redwood timber will be cut, while the lumbermen, on their side, have cordially backed the idea that some of the finest groves should be saved. These so-called hard-headed businessmen have made several gifts of timberlands, while again and again they have postponed logging in certain areas at the behest of the League, sometimes with considerable inconvenience and financial loss.

The third year also brought the

League's first major victory, when the State Legislature voted a \$300,000 appropriation to acquire state parks on a 50-50 basis to match private contributions. The story goes that Governor William D. Stephens eyed the bill unenthusiastically, pleading state poverty and the necessity of enlarging the school system. At this point William Kent jumped to his feet and shouted: "Hell, Bill! Close the schools. The kids would love it, and they could make up the work in a couple of years. If we lose these trees it will take 2000 years to make *them* up." Fortunately there was enough for both. Stephens signed the bill, and this appropriation enabled the League to purchase a 2000-acre, 12-mile strip along the new highway in 1922. It became the nucleus for the famous Humboldt State Redwood Park.

The second primary objective—that of establishing a Redwoods National Park—languished and was never achieved. But in the next few

years the League pushed forward on the main front, gathering speed and momentum. In 1925, it backed a bill to create a State Park Commission and a survey of suitable lands for park purposes. The first bill passed the Legislature but was killed by Governor Richardson's veto in 1926. However, a duplicate measure became law the following year. As head of the two-year survey, Frederick Law Olmsted, celebrated landscape architect, became a valued state park consultant and staunch friend of the Save-the-Redwoods League. The first measure was followed in 1928 by the people of California voting a \$6,000,000 bond issue for a matching fund to acquire the parks recommended by Olmsted's survey. Thus, largely due to the efforts of the League, a tremendous impetus was given to the preservation of the state's remark-

able scenic resources. The success of California's State Park Commission can be measured by a growth in the past 24 years from 5 state parks and 9 monuments to 90 exceptional areas covering 500,000 acres and valued at more than \$25,000,000.

Another major achievement of the League was the purchase of around 14,000 acres in Humboldt County's Bull Creek Flat area, ranked as the supreme pure redwood stand of them all. This was made possible by a \$2,000,000 windfall from John D. Rockefeller, Jr. and another million in donations from various sources. With the Redwood Highway in Humboldt County pretty well lined with state-owned trees, the League then turned its attention south to Mendocino County and northward to the rugged, fog-bound coastal

Continued on page 44

▼ THE AVENUE OF GIANTS: a view along the Redwood Highway in an area yet to be preserved. Much remains to be done for the preservation of the redwoods

Moulis, photo. from Save-The-Redwoods League



➤ ONCE a lake and "dawn red woods" brightened the landscape in this part of Montana where the fossilized insects were found

▼ SPLITTING THE SHALE into paper-thin sheets in search of the preserved remains of fragile insects that lived many millions of years ago



Ancient Wings in the rocks

By HENRY P. ZUIDEMA

"AREN'T there enough insects here now without digging up more of them?" asked the Montana rancher, wiping a dozen robust mosquitoes from his neck as he finished cutting a field of hay. "Cutting hay," he explained, "drives them wild." Then he got down from his tractor and enjoyed a laugh at the expense of a couple of paleontologists who were going to spend the rest of the summer splitting shale in a near-by gulch.

We agreed with him that mankind does share the globe with a rather large assemblage of insects. The "bugologists" tell us, in fact, that some 15,000 species live within

50 miles of New York, that some 656,000 different species have been described from all parts of the world, and that when the insect scientists ever complete their work in the distant future, the number of kinds may prove to be over several millions.

We also reflected that the creatures the layman indiscriminately calls "bugs" preceded man on the earth by quite some time and that the pessimists predict that the insects will be the last to leave it. We remembered that the insects did a better job than the dinosaurs in finding ways to survive. And they have perfected the mechanisms of

flight to such a degree that aeronautical engineers still bow before the flying prowess of the bumblebee.

One airplane builder we know, seeking ways to approach insect efficiency, put up a large-scale model of an insect's wings in his laboratory the other day. He thinks they have features that may be built into the planes of the future. The wings are those of a dragonfly, whose ancestors shared the airways with the flying reptiles 150 million years ago!

Yet despite their very great antiquity (the earliest unquestionable insects are found in the coal-bearing rocks of over 250 million years



◀ A CRANE FLY with a wing spread of more than two inches. Note the fine preservation of the delicate vein pattern of the wings, permitting identification of the insect as belonging to the genus *Tipula*. Observe also the balancing organ, or halter, projecting from the body behind the base of the left wing. A crane fly with only one balancing organ certainly *would* tailspin into the mud and die. But a more likely verdict is, "Death from natural causes and loss during fossilization"

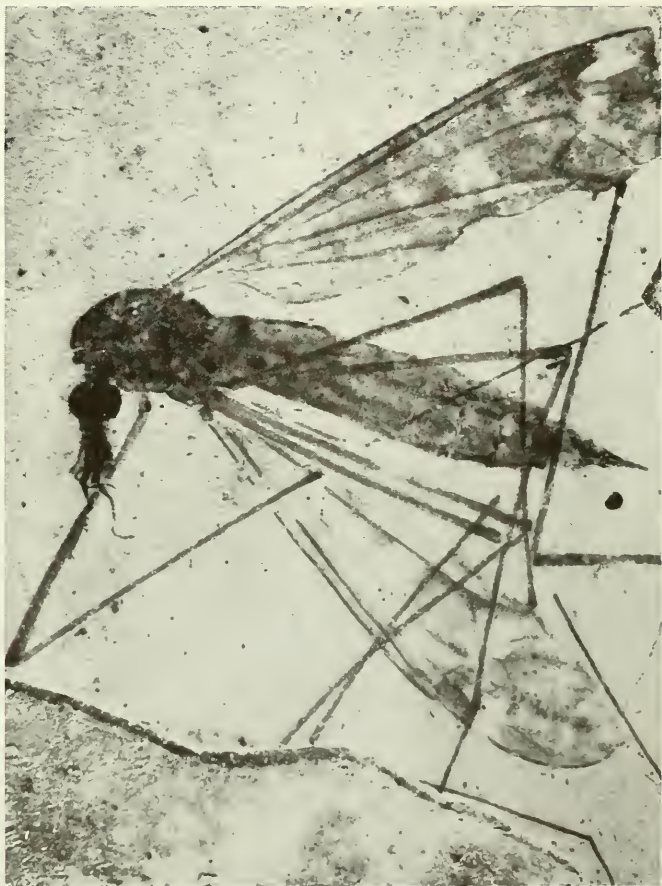
▼ ANOTHER CRANE FLY, its form marvelously preserved for something like 20,000,000 years. Its body was one inch long

Landscapes and life
of 20 million years ago
live again
when a shale-splitting
geologist opens
some gossamer pages
of the dim past

ago), and although incomprehensible numbers have buzzed about since that time, only some 12,000 fossil species have been described. This despite more than a century of search by geologists in many parts of the world.

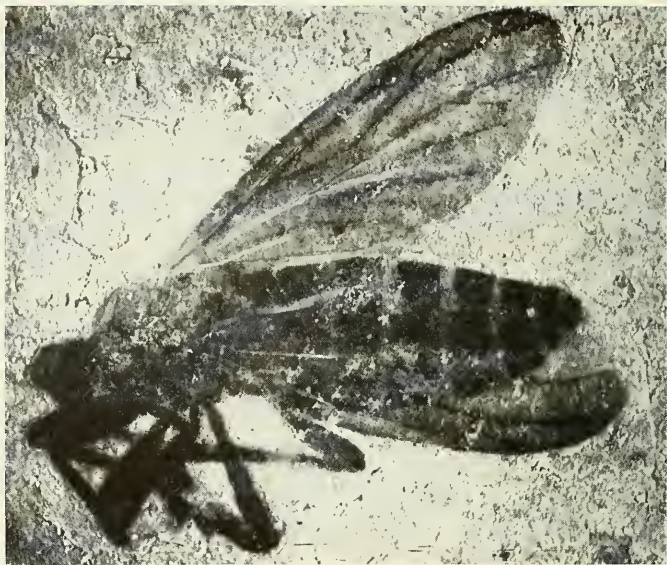
One can, in fact, check off on the fingers of one hand the really important localities where large numbers of well-preserved ancient insects have been found. First to come to mind will be the Baltic coast, with its marvelous amber—the fossil resin which caught and preserved the fragile forms of life millions of years ago.

Only rarely do unusual circum-

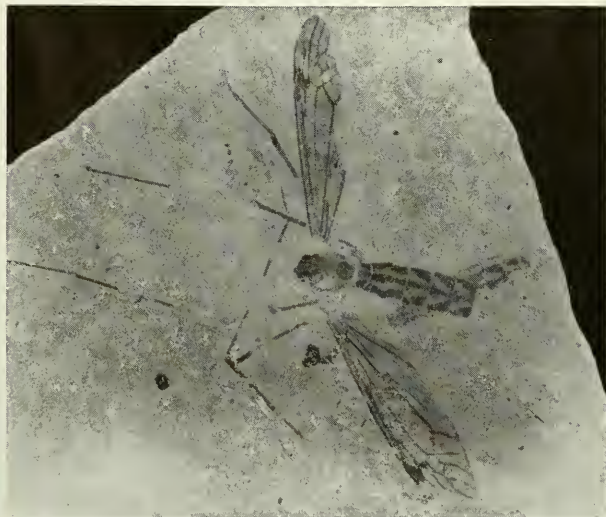




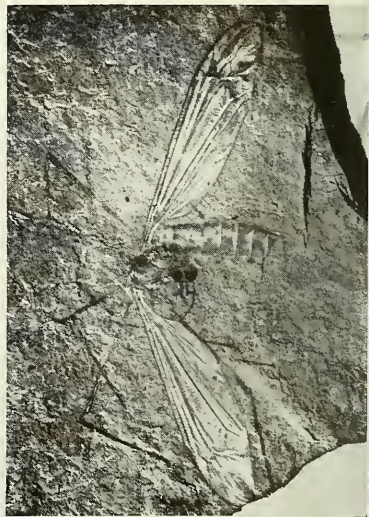
▲ THE AUTHOR and his wife at the dig. The rock could be split into such thin layers that light actually passed through it



▲ ALTHOUGH 686,000 different insects are known in the world today, only about 12,000 fossil insects have been described. Because of their smallness and delicacy, their preservation through millions of years depends upon extremely unusual circumstances. This is a bibionid fly with a body less than $\frac{1}{2}$ an inch long.



▲ PATIENCE AND SHARP EYES are required to find specimens like this, and photographing them in such a way as to show every possible detail for scientific study is an art in itself



▲ AN EXCELLENT SPECIMEN and a remarkable photographic enlargement of a crane fly, whose modern relatives still frequent wet meadows in many parts of North America

stances occur to make possible the fossilization of such delicate creatures as the tiny midge we see dancing in the summer sun. One can search the rocks for years without finding a single recognizable insect. So scant is the geologic record and so great the variety of insects that it is a good guess that not one of the insects the reader has seen—or swatted—within his lifetime will be preserved for the future. And yet here on a June day in Montana, there awaited exploration less than a mile from where we stood—a thick series of rock layers that was to yield in a few weeks many well-preserved insects.

Moreover, as we dug, there came to light the picture of ancient life along the shores of a small lake that existed some 20 or more million years ago. We envisaged the insects that gathered there in nuptial flight and saw in our mind's eye their winged enemies—solitary hunters preying on their vegetarian neighbors. All this amid groves of stately sequoias and meadows of flowering plants that thrived before the present Rockies crowned the horizon.

It had happened at a time when sunsets all around the earth were made brilliant by vast clouds of volcanic dust rising to the upper atmosphere, when fire-mountains in the Yellowstone and to the northwest were spouting ash with awesome frequency. But if the even tenor of life was interrupted again and again in the ancient land of Montana, plant and animal life lived elsewhere in harmony with nature. Across the seas, the Alps had not yet risen to give scenic grandeur to Switzerland, and a lush lowland with wide rivers and tropical growth gave southern Europe the aspect of the present valleys of the Amazon and the Orinoco.

The first hint of what awaited us in our Montana valley where the rancher was cutting hay along the river came when we were prospecting not for insects but for fossil mammals. We needed mammals as time-markers, for our specific task was to reconstruct the geologic events that have taken place in the

area around the present headwaters of the Missouri. Such work would add to our knowledge of the history of the Rocky Mountain region following the great uplifts that heralded the era of mammals some 70 million years ago.

After much crawling on hands and knees along the arroyos that dissect the intermontane basins of Montana, we had the good luck to discover the fossil bones of ancient horses at two localities. Replacement of the original bone by minerals had preserved them without loss of detail. These horses, though much smaller than the modern species, already walked on one toe of each foot, with two lateral toes well off the ground. These ancient remains gave us a clue to the age of the uppermost rocks of the area. They belonged to a horse tribe close to the genus *Merychippus*, which in other regions has left its bones in layers deposited from twelve to fifteen million years ago, in the later part of the Miocene epoch. Below these layers were older rocks of a markedly different type. They were shales, once fine sediments deposited in quiet waters and containing considerable volcanic ash. Such shales are ideal for the preservation of delicate organisms, and we were not too incredulous when our rancher friend recalled that he had once seen a "fossil gnat" in them!

We couldn't wait for the sun to climb over the east range before shifting our camp in order to be closer to the white patches that marked the outcrops of the shales. Removal of a thin overburden of gravel held together by the roots of the greasewood and cactus disclosed fresh layers of the shale. So thin were the individual layers of these fissile shales that when dry and exposed to the wind they blew away like scraps of paper. Here was a rock that could be split into such thin layers with a knife blade that light actually passed through it. Each layer was split patiently into many thin laminae, examined, and cast aside. As the day wore on and the pile of cast-off shale grew at our feet, we wondered whether the

"fossil gnat" of the rancher was the companion of the mythical "sidehill walloper" and other creatures invented by the fun-loving cattlemen for the initiation of the tenderfoot to the wonders (real and imagined) of the West.

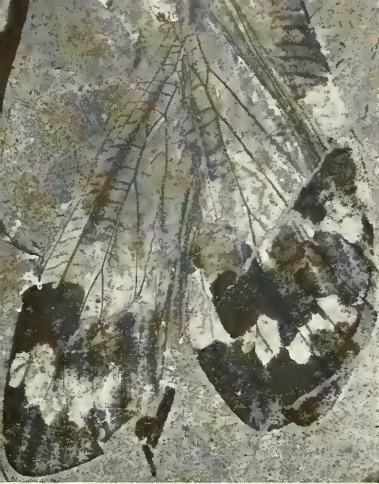
The excited cry of "Look at this!" first came from a first-year member of the digging party. Beginner's luck seems to apply to paleontology as well as to poker. Preserved on the face of a freshly split fragment of shale was a crane fly measuring more than two inches between wing tips. Preservation was so complete that the delicate vein pattern of the wings readily permitted identification as a member of the still-surviving genus *Tipula*. A member of this genus today frequents the wet meadows and damp woods from South Carolina to Iowa and north to Newfoundland and Quebec.

The crane flies today are found near streams and ponds, and we surmised that our specimen was pursuing similar habits when a gust of wind forced it down upon the sticky surface of a mud flat on the shores of an ancient lake. In "stop-motion" pose, this creature rested as it had fallen millions of years ago. Just below the left wing we could even see one of the tiny halteres, or balancing organs. During flight, as shown by high-speed photography of the living flies*, the halteres vibrate with extreme rapidity. They do not spin like a rotary gyroscope, but they enable the fly, in a similar way, to keep on a straight course or to bank properly on sharp turns.

Such a perfect landing as our specimen had made was certainly most fortunate from our point of view. We knew we had made a rare find. As exploration of the shale continued, we found more crane flies, some showing additional parts of their structure but not, as in the case of the first find, poised as in flight.

That great order of insects, the *Diptera*, or flies, was well represented in the shales. We found midges, soldier flies, syrphids, and

* See "How Flies Fly," by C. H. Curran, *NATURAL HISTORY*, February, 1948.



◀ MUCH about the landscape and climate of long ago can be deduced from specimens like these and the many plant remains that were found in association with the insects. These are the wings of one of the Sialidae and a katydid femur

▼ A CLICK BEETLE, whose last click died away in the balmy atmosphere of a climate much less arid than today



bibionids. Finally, while inspecting a fragment of shale in the laboratory under the binocular microscope, we discovered that the rancher had not exaggerated. We, too, had found a fossil gnat!

At the end of the season our collection included members of 10 of the approximately 26 major groups, or orders, of insects. The shales had given us grasshoppers, earwigs, plant hoppers, fungus gnats, May fly nymphs, scorpion flies of the genus *Panorpa*, click beetles, scarabs, snout beetles, wasps, ants, bees, and the nerve-winged alder flies, and such "true bugs" as the squash bug.

As we wondered about the paucity of aquatic life in the ancient lake, one of our shale splitters came upon some fish scales. These were

identified as belonging to *Amia*, the bowfin of ancient ancestry, whose descendants persist today in the fresh waters of North America. Later the carbonaceous outline of a bowfin was found.

These fishes thrive today in the weedy, shallow, and muddy waters of warm lakes and rivers. We seemed justified in projecting these conditions into the deep past. Frequent obstruction of streams by volcanic debris would have led to the forming of temporary, shallow lakes such as the one whose muds and silts preserved the insects. This explained the presence in the shales of the alder flies which, unlike their cousins the dobson flies, lay their eggs in quiet waters.

Gradually the picture of the ancient landscape unfolded for us.

We were aided by frequent discoveries of well-preserved fossil leaves, fruits, and occasional flowers. The finding of the fruit of *Ailanthus*, the "tree of heaven," assured us that this tree was still thriving in this area in Miocene times. Soon it was to become extinct in North America, but it continued to live in Asia. Brought back to this continent by man in about 1820, it was planted on Long Island and has continued to be "the tree that grows in Brooklyn"—as well as over much of the rest of our land.

Frequently we came upon the leaves of the willow, thorn apple, maple, alder, rose, and a small fern-like plant whose descendants grow today in the shade of California's giant sequoias. And there were leaves and stems of buckthorns and horsetails and an evergreen of the barberry family.

The needles and cones of the sequoias appeared nearly every day as we patiently worked the shale. And there were numerous fragments of *Metasequoia*, which is closely related to both the California redwood, *Sequoia sempervirens*, and the swamp cypress of the southeastern United States, *Taxodium distichum*. Dr. Roland W. Brown of the Smithsonian Institution looked over the fossil flora from the shale and recalled that the geologic record shows that *Metasequoia* was a most abundant and widely distributed genus in North America from the time of the dinosaurs of the Mesozoic era well into the Miocene epoch in the era of mammals.

The wondrous history of these stately relatives of our living sequoias was discussed in *NATURAL HISTORY* for December, 1948, by Ralph W. Chaney of the University of California. They disappeared from this continent some twelve million years ago at the close of the Miocene, but they survived into the succeeding Pliocene period in Japan, where their needle-like leaves are found in the brown coal of Honshu. And a few years ago the world received the news of the discovery of a living grove of this "Dawn Redwood" in the remote interior of China.

Leaving our shale pits for another season, we could envision this area as a fairly well-watered region in a moderate climate where today, by contrast, the pronghorn antelope and the jack rabbit scamper among the sagebrush of a mountainous, semiarid land. Looking back through the millions of years with the help of our plant and insect fos-

sils, we could see our small lake lying at an altitude of no more than 1500 feet but with somewhat higher land near by, as shown by the fossil pines in the shale.

Then the winds had carried far-blown material, thrown aloft by volcanic force. Slow elevation had raised the Rocky Mountain region. And a gradual change had occurred

in the climate from warm and moist to cool and dry. All these changes had altered the face of nature in the West. But for him who reads the rocks, the scene is not lost—even to the fall of a delicate, winged creature, which achieved an approach to immortality by ending its flight on a mud flat in Montana, long before man trod this earth.



Photo by Lillian Wilson

▲ THE BIRDS are innocent traffic stoppers. It is almost as if they said, "Why should you stare at me any more than I should stare at you?"

The Stately Penguins

Their daily promenade through the streets of Edinburgh has won fame and affection for the largest assemblage of penguins on public view anywhere in the world

By RAE OETTING

AMONG the 100 penguins at the Royal Edinburgh Zoo of Scotland there are at present nearly 50 King Penguins, which are distinguished from all others by a bright gold band of feathers

around the neck. All these birds are gifts from a whaling firm, which brings reinforcements almost every year. Every day at 11 A.M. these droll, sober-faced birds are taken for a walk. Should their keeper be a few minutes late for this conducted tour, the birds raise a great squawking clamor.

They march single-column right through the Zoo and onto the public highway. The walk covers over a mile and takes about an hour. The birds are innocent traffic stoppers, and to all appearances they are unaware of the sensation they are creating. They have to subject every bright object to a thorough scrutiny. They turn their heads from side to side, eyeing the object from every angle. Then, their curiosity satisfied, they march sedately ahead.

The birds are said to show a friendly interest toward the many visitors who come to see them at the Edinburgh Zoo. Their habit of standing for hours in one spot, with their heads cocked to one side and their attention riveted on a speaker in a most flattering manner, has given them the reputation of being the politician's dream of a perfect audience.

In the wild, however, the King Penguin may behave differently. The well-known authority Dr. Robert Cushman Murphy says that when he began an oration to the King Penguins on South Georgia Island, they turned their backs on him. He suggests that his birds may not have been educated to the ways of modern civilization, or that perhaps it makes a difference what you say to them!



◀ **ACROBATIC JILL**, a captive platypus, endeavoring to open Mr. Fleay's hand to get an earthworm. Note the open groove containing the eye and ear

*Photo by D. H. Fleay
from Black Star*

➤ **ON LOCATION** in platypus-land: Harry Malcolm (photographer) with back to camera and Lex Halliday, arranging the tripod opposite the entrance to a burrow that Messrs. Fleay and Baker are preparing to dig

Photo by David Fleay



Movie-Making **in Platypus-land**

The furry animal that lays eggs and has a bill like a duck gave a scientific film team some strenuous moments but won a mammalian "Oscar" by being selected by the Edinburgh Film Festival

By DAVID FLEAY

WHEN I received a letter from Lex Halliday of Australian Instructional Films, asking for co-operation in the production of a film on the life of the platypus in its native haunts, my imagination needed no spur to visualize that here, indeed, would be a job and a half.

Lex had been a R. A. A. F. bomber pilot in the southwest Pacific during the war and had thought much about his country's "living fossil" fauna. He wondered how he could best educate young Australians regarding the unique and fascinating natural history heritage that one day would rest in their keeping.

Taking a plunge on his return, he formed his Instructional Film Company and produced first of all a splendid Koala film. His ideas were not only idealistic but sound. Now he had received permission from the Victorian Fisheries and Game Chief (Mr. Dunbavin Butcher) to excavate certain platypus burrows for the purposes of this educational film; so I agreed to put in three weeks with him and his men along some of the streams in the state of Victoria.

Late November, 1950, was the period chosen, in the hope that some aspects of the breeding period could be photographed; but thanks

to torrential rains and sustained high waters in local streams, it was not until early December that we were able to get down to work.

In addition to the camera team, we had with us a specially chosen small boy who was to be the central figure, "Johnny." The film was to follow Johnny's adventures in platypus-land from the moment his school broke up for the Christmas holidays through his country stay with the Fleay family. Needless to say, "Johnny" (twelve-year-old Mervyn Bullas) was genuinely excited and was quite as full of round-eyed wonder as the producer could have hoped.



Photos by David Flay

◀ UNEARTHED from her burrow, this female duckbill is being inspected by Mervyn Bullas, the "Johnny" of the film. The animal growled shrilly when disturbed. Note the smooth and almost perpendicular slide down the burrow floor to the water

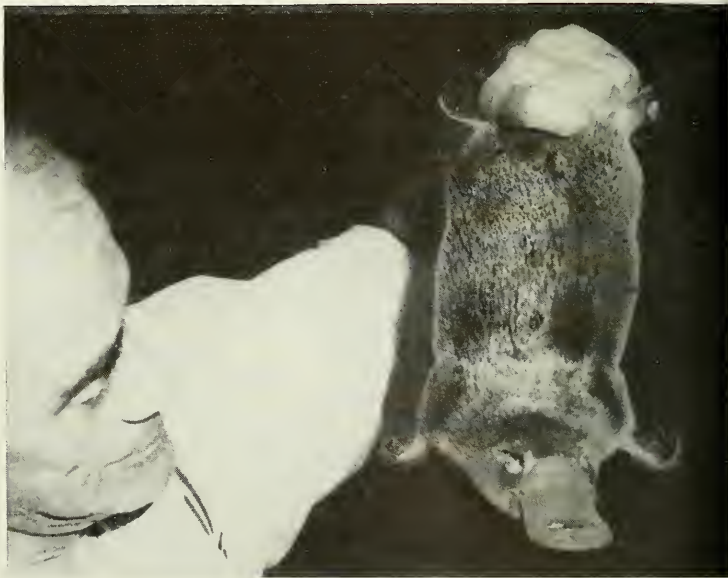
➤ THE LATE H. G. WELLS observing a platypus at close range at the Sanctuary at Healesville, which he visited in 1939

▼ A BABY male platypus about three months old that had just emerged from its nesting burrow

Having carried out a week-long nighttime reconnaissance of stretches of the Watts River (a tributary of Melbourne's Yarra), I knew about where the platypus burrows were likely to be found, and early on the morning of December 12, 1950, our two trucks and gear were driven to the nearest accessible point.

Flowing deep between steep banks, the Watts, with its dark log-spanned pools, is canopied by graceful old eucalypts and the acacias known as Blackwood and Silver Wattle. The trunks are tied into an impenetrable and disheartening tangle by the blackberry bramble and honeysuckle creeper (both imported). Cruelly barbed blackberries extend in heaped masses from the water's edge upward. In order to find duckbill burrows, we had to wade in the river, examining the narrow mud edge for evidence of the habitual slide and the blunt claw marks made by a platypus in its comings and goings.

The burrow itself would be from one to twenty feet up the otherwise dry and hard clay bank. Were it merely a matter of locating the unmistakable flat-oval entrances to the platypus homes, our task would have been comparatively simple; but rabbits had literally honeycombed the riverbanks with extensive warrens, usually in impregnable posi-



tions among the buttress roots of the huge trees. Platypuses enter these complicated larger burrows and run off them at convenient points. In fact, bunny has been a godsend to these lowly but by no means stupid mammalian egg layers. In such streams as the Watts, the rabbit has actually contributed substantially toward the safety and shelter of the platypus, apart from providing numerous ready-made homes in time of flood.

Our difficult and stumbling progress up and down the river yielded clues of mud slides at certain points and a few burrows unmistakably of platypus origin. Positions were staked, and eventually we brought brush hooks, picks, shovels, spades, and mattocks to a point on the bank above the first "prospect." Then came the hard slogging work of the ensuing weeks. Through it we all gained muscle, experience, and a growing respect for the elusive little



Photo by Pearl from Black Star

duckbill in the difficult habitat to which it is so well adapted.

First, the cruelly barbed undergrowth had to be cut away. Then, beginning at the burrow doorway, we dug cautiously upward, for there was always a possibility of injuring the occupant when it finally tried to escape, as it surely would, toward the water. The roofs of typical platypus burrows are seldom more than four to eight inches below the surface at any point, but big roots, embedded logs, and rocks complicated the problem.

Harry Malcolm and Frank Jenkins, the moviemen, had to mount their tripods in midstream to cover this phase of operations and to photograph the tunnel windings and resting chambers step by step as the earth was removed. Here we saw the "pug blocks"—plugs of well-worked, powdery earth, placed at intervals in the nesting burrow. They probably serve to maintain humidity and keep the eggs from

drying out, and later to protect the young. Reflectors were necessary to light up the dark overhanging banks.

Again and again we laboriously excavated empty but recently occupied burrows. In some cases, they broke into hopelessly long rabbit warrens. Though plentifully peopled by platypuses, the Watts River nearly broke our hearts as a digging proposition. There were obviously scores more burrows than animals. Nevertheless, an adult female, a twelve-month-old male, and a real "old man" captured at night in the dark rippling waters provided ideal subjects for morning shots of the animals swimming in shallow water and close-up studies of the remarkable bill, feet, fur, and venom spurs.

The venom spurs are located on the heels of the hind feet of the males. They appear to be used mainly in battles that occur when one male infringes upon the territory of another. Evidently the poi-

sonous secretion varies seasonally, being most potent at breeding time. The effect of the poison on man is comparable to that of the Australian Black Snake. There is intense pain and considerable swelling of the whole limb, lasting for days or weeks.

The one action that came most naturally to our temperamental stars was the crash dive. It was a precipitate plunge that showered water in all directions, a feat that only a platypus can perform—and this, of course, the cameras also recorded.

All three animals were infested on the ankles of the hind feet with the small red tick (*Ixodes ornithorhynchi*) peculiar to the duckbill alone. Interestingly enough, when a platypus is kept in captivity in hay-filled "tunnels," it soon rubs these ticks off; but in the wild, it appears unable to dislodge the parasites from its ankles. Before we freed the animals, a pair of forceps was used to good effect in ridding them of their irritating passengers.

We had little reward for days of strenuous navying on the Watts riverbanks. We did meet the duckbill's aquatic associate—the fine, fur-bearing water rat (*Hydromys chrysogaster*) of formidable chisel teeth—and Lex Halliday had one good fall down a bank into the blackberries. So we changed location some miles to Chum Creek. This was another of the streams prospected in 1946 when we gathered the nineteen platypuses from which the New York Zoological Society's "Cecil," "Penelope," and "Betty" were selected.

The Chum is a far smaller stream, with banks less molested by the rabbit. Here in very hot weather the water was cool and pleasant—a welcome respite between bouts of digging. Needless to say, a stumble could precipitate an unintentional bath at any time. But prospecting was easier in spite of submerged logs, rocks, and innumerable snags. We became a trifle chary about delving our hands at random into burrows, particularly after picking up a fat copper-headed snake on an

island. This is different from the American copperhead. It has poor biting fangs, but its neurotoxic poison is estimated to have one-fourth the killing power of the Indian cobra. Hard digging with the mattock along one burrow would be rewarded by a splash farther down the bank, as a wary platypus left hurriedly by another and heretofore undiscovered opening.

The mother platypus does her best to avoid being flooded during the spring season, when she is busy with the precious eggs and young. Toward this end, she digs the nesting burrow as much as ten feet above the water level. Only a few yards from one of these nesting burrows and opening off the same secluded pool was a classic camping burrow, with its entrance completely screened by the overhanging bank. The cameramen found excellent opportunities here, as direct sunlight lit the scene. The fresh burrow was only seven feet long and almost perpendicular in its steep upgrade run. In fact, but for the tunnel's slight S-shaped bends, the occupant would probably have tobogganed at speed each time it left the scooped-out floor of the resting chamber. As it was, the floor of the burrow was smooth and almost polished from constant rubbing by the platypus in its sliding passage to and from the water.

The occupant growled shrilly as the mattock gradually approached its bare sleeping room, and the petulant "clucky hen" noise is reproduced faithfully in the film. The platypus was intercepted as it attempted a fast slide down the open burrow to the water. She was a typical adult female, seventeen and a half inches in length.

We were muddy, wet, and fagged out each evening, and we were in the habit of "boiling the billy" beside the stream at a wide stretch where we could watch an artificial lake formed by damming of the small valley. Here on "Lake Yumbunga" two platypuses (almost certainly females with young in burrows) emerged each evening and fed energetically out in the open

water as the sun sank. Could we find their nursery burrows? Not a hope of it, even though the nesting area of one of them was located beyond doubt. We searched carefully, and a crew member even explored the banks by hand, but we found nothing. At seven one morning, we found the mother outside her burrow, vigorously and continuously preening her fur with her hind foot between ravenous feedings. These actions were similar to those of "Jill," our breeding platypus, who, in the summer of 1943, acted in this manner after long shifts in the burrow with her baby.

On Lake Yumbunga a conservation lesson was inserted in Johnny's platypus education. The scene showed Frank Wandin, an aborigine, out in a boat by a reed bed pulling in a "drowned" platypus in a fisherman's drum net. This is a drum-shaped net with a concave entrance narrowing to a small hole. It is illegally set in many fresh-water streams and is the greatest single cause of platypus destruction. The inclusion of the stuffed animal, with Frank Wandin as the poacher casting it away, should serve a very useful propaganda purpose.

Young Johnny's experiences in platypus-land had now been fairly comprehensive. With genuine excitement, he had watched the animals swimming in their native haunts and had inspected their burrows. He had experienced the great thrill of handling one to observe its anatomical peculiarities. He had been made familiar with platypus nests, types of food, the geographical range of the animal, and even its history. He had been introduced to the best writings about the animal, particularly Harry Burrell's fine publication *The Platypus*.

In a final effort to excavate mother and young, which we had failed to accomplish in some 17 days of thorough search, Lex Halliday and I packed camping gear and drove a panel van 120 miles to the Barwon River, Western Victoria. It is a curious fact that duckbills of this Western District are altogether finer specimens than those of the

Yarra and its tributaries. There is little or no undergrowth along the banks of the Barwon, but on arrival we gradually pieced together evidence that a record spring flood six weeks previously had submerged even the high banks of this fine stream. Unfortunately, one burrow after another showed silting and water action. We dug into a fresh-looking tunnel recently excavated by a platypus and situated well up a bank; and after five feet of it had been uncovered, a rubbery beak thrust itself momentarily through the loose dirt and hastily withdrew again.

Encouraged mightily, we dug rapidly but carefully, dripping with perspiration on this red-hot summer day, to be greeted by the usual growl of protest as we neared the end chamber ten feet farther on. An exceptionally large female duckbill with beautiful fur was our reward. The abraded stiff hair of her tail hinted that she had been occupied with nesting duties until recently. However, there was not the slightest sign of nest or young. A disappointment again. Her presence in a new and unlined burrow plus the evidence of a top-notch flood indicated the likelihood that practically all platypus breeding along the Barwon River had been ruined for the 1950 season.

On account of their much abbreviated and sideways-placed legs, platypuses are usually thought of as slow movers on land. But the liberation of this female on the long, gently sloping bank was an eye-opener. She streaked toward the water and entered with a resounding splash. She did not surface again, though we were above the pool for some time. In such cases, a frightened platypus surreptitiously pushes the bill tip above the surface at five-minute intervals, preferably through weeds, until the nostrils reach air. Then, ever so gently, the "snorkel apparatus" is withdrawn.

Sun-browned, blistered, and mosquito-bitten, but with muscles hardened after the three-week hunt, the camera crew returned to Sydney,



Photo by David Fleay

where the finished film eventually came forth from Avondale Studios. It was awarded a high honor at the Edinburgh Film Festival by being selected as one of the only two Australian films shown, and it is used today by Australian museums and schools in their educational programs. The fact that a week or so after Mr. Halliday's departure I found a baby male platypus making its first excursion out of the nesting burrow was an illustration of the cussedness of life. Nevertheless, the film was sufficiently varied and comprehensive to do without the opportunity that came late—as opportunities so often do!

"Teddy," that same but no longer little platypus, is still with us and now lives in a large platypussary at our new fauna reserve on Tallebudgera Creek, West Burleigh, Queensland.



Photo by D. H. Fleay from Black Star

◀ **TWIN EGGS** of the platypus. If the animal were a bird instead of a mammal, a much smaller adult would be expected to grow from eggs so small

▲ **THE RUBBERY LOOKING** baby platypus at 8½ weeks is covered with a very short growth of satiny fur. It is 9 inches long, blind, and entirely helpless

▼ **THE NOSTRILS** near the end of the bill permit the frightened platypus to take a new breath without showing the rest of its head above water

New York Zoological Society photo



groves of Del Norte County.

And so the Save-the-Redwoods League grew and flourished through the years. Today, the League is headed by Arthur E. Connick, Chairman of the Board of the Pacific National Fire Insurance Company, long-time League officer and a former member of the California State Park Commission. The position of administrative secretary for the past twelve years has been capably handled by Aubrey Drury, Newton Drury's brother, a San Francisco advertising executive and a writer of note.

The surprising growth and continued vitality of the Save-the-Redwoods movement resembles that of the great trees themselves. And like them its strength is derived from an extensive root system. Its nourishment comes from hundreds of cities, towns, and crossroads throughout the land. The majority of those interested in the work of the League become Annual Members by paying very modest dues. But perhaps what has caught the public imagination most strongly and may have contributed more than anything else to the success of the movement, is redwood groves as "Ever-living Memorials." This is the most brilliant example of linking conservation with human sentiment ever devised. The idea started when John C. Phillips of Wenham, Massachusetts, contributed \$12,000 for a grove in memory of his brother-in-law, Colonel Reynal C. Bolling, first high-ranking American officer killed in World War I. The League then adopted memorial groves as one of its major policies, and since the dedication of Bolling Grove in 1921, 125 of these memorials—"More Enduring than Granite"—have been established among the redwoods. Grandest of all is the National Tribute Grove, dedicated to the men and women, both living and dead, of our armed forces in the Second World War. This superb 5000-acre tract of primeval forest in the Smith River-Mill Creek region of Del Norte County was

made possible by the contributions of scores of individuals and organizations, from school children to the Daughters of the American Revolution.

Available memorial groves vary in size from forty acres to several hundred. The fee paid by the person reserving one does not buy the grove. It provides that a chosen tract, already belonging to the League, will be deeded to California as a part of its State Park system and that the sum will be used by the League to buy additional redwood land from private owners. The contribution also guarantees that the grove will bear the name of the person to whom it is dedicated, in perpetuity; the State will erect attractive rustic signs at the entrances to the grove, giving its name; and will provide a boulder in a suitable location upon which a memorial plaque may be placed.

Redwood tracts are also set apart to honor living celebrities. Clubs, societies, and organizations can donate them. There is now an Earl Warren Grove, given by friends and admirers of California's governor. The Garden Club of America has contributed groves, and one is projected by the Sierra Club. In the near future, big tree memorials will also be available for the first time to immortalize the gigantic brother sequoias of South Calaveras Grove, high on the forested shoulders of the lofty Sierra Nevada.

Success story? Yes—the like of which has seldom been achieved in the history of conservation. But today, logging in the redwoods of Humboldt and Del Norte counties is going on at a greater speed than ever before. Over 300 sawmills are feeding on the giant redwoods at the rate of 10,000 acres a year. Some of the choicest groves are in the path of destruction, and it is urgent that they be saved before it is too late. At present the League is working intensively to rescue the virgin redwoods in the Smith River region, the Prairie Creek area, and the Avenue of Giants, one of the

most spectacular stands on the Redwood Highway. Once more the Save-the-Redwoods League faces a critical period, and it needs the active help of all its 16,000 members, as well as all others who believe that these sublime samples of original America should be preserved for the benefit, enjoyment, and inspiration of present and future Americans.

Again my wife and I drove up the Redwood Highway. As we passed through the vast living aisles among towering trees, I thought of the Iowa man we had met at the Whittemore Grove several years before.

"It's a fine thing somebody's doing something about saving these trees," he had remarked.

I was suddenly struck with an idea.

"Let's us do something about it," I said to my wife.

"Let's," she agreed, her eyes sparkling. "I was thinking the same thing. She would have liked it."

So we went back to San Francisco to see Aubrey Drury about a redwood grove in memory of my mother, who had recently died. He gave us detailed information and a sheaf of maps which enabled us to find our way. We chose a beautiful grove near the Madison Grant Forest and Elk Refuge. It is now a part of the Prairie Creek Redwoods State Park, and to my wife and me it is a particularly fitting memorial to a person who was a deep lover of Nature.

I like to think of my mother in spirit wandering beside the little fern-edged brook that comes tumbling down through the forest, and enjoying the quiet peace and contentment that she always found best in Nature's unspoiled places. And if we ever place a plaque there in her memory, it will bear the words of John Muir, California's eminent naturalist and conservationist:

... "A thousand wonders are calling. Look up and down, and round about you."

For not the least of these wonders are the glorious Redwoods—the Immortal Trees.

How Pathfinder Magazine says: *You* CAN DISCOVER THE SECRET OF LOW-COST TRAVEL

from an article in the bi-weekly news magazine, THE PATHFINDER:

Dream trips you can afford:

ROUND THE WORLD FOR \$478

THE LITTLE Tyrhennia Line steamer *Olbia* takes a couple of days to butt through the Mediterranean, from Genoa via Leghorn to brigand-riddled Corsica. If you're aboard, don't stay up late watching the wild mountain dances of Ligurian peasants on the steerage deck. For you must be on deck at dawn—while you pass the lone island of Capraia, with salt-blown Elba to the south—to watch for the high Corsican peaks to show above the horizon.

At \$6.50 (including five full meals), the *Olbia's* voyage is a fair example of dream trips you can afford. And there are others—colorful journeys to exotic lands that often cost little more than your vacation at home. Trade your usual beach for a houseboat in the Vale of Kashmir, or a cruise among the lesser Caribbean islands by native trading schooner.

You can travel clear around the world—to South Seas coral isles and the misty lakes of New Zealand, to Australia and the plains of Africa, to Europe's leisurely antiquity—for just \$478 in fares. That long steamer jaunt can be duplicated in ten days by plane for \$1,700, but where's the fun?

Last year, 52 million Americans spent a record of \$12 billion on vacations. Many went on organized cruises at prices from \$125 to \$25,000. But some traveled off the tourist track, got cheaper and more glamorous vacations.

JUST REMEMBER

- • Bargain paradises get that way because they haven't been discovered by tourist mobs. They're harder to find and to reach—but more rewarding.
- • Chromed ocean liners and international hotels are America transplanted. For fun at budget prices, go by freighter and stay at pensions.
- • Make your longest hop from Europe, not directly from the U. S. Currency differentials and lower European rates can save up to 50%.
- • Don't go unless you're ready to plan well ahead and to shop for travel bargains.

CARIBBEAN. There are still undiscovered Edens of America's back door. Tobago, the Robinson Crusoe island that rivals Tahiti, where living is so cheap the island's chief official gets only \$240 a month. Or Grenada, which, as a native described it: "Dis islan', suh, is t'ing Gohd mek from rainbo'." There, for \$12 a week, you can rent a three-bedroom house with its own private beach. Many of the best spots can be reached only by trading schooner: Go down to the waterfront at Grenada or elsewhere and bargain with dusky skippers to make your own price—keep this up and cruise all the lesser islands of this jeweled chain.

Here is a sampling of dream trips

Round the World. Every 2 months a Shaw Savill Line vessel leaves London for Curacao, Panama, and New Zealand. Cross the Pacific, change at Wellington for another SSL ship going west via Australia and South Africa back to England. Minimum fare \$478—but the trip is usually booked up 15 months in advance. (Reach London for about \$175 from New York.) Other round the world trips as low as \$250-\$300 a month from the U. S. via deluxe freighters.

India. Minimum fare from New York to Ceylon, India, or Malaya is about \$350. Transhipping in England, you can make the trip by luxury liner (tourist class) for \$319. Go to the lotus-covered mountain lakes of Kashmir, where a furnished houseboat with four turbaned servants rents for \$70 a month. Total costs for a couple run around \$175 a month—in the most beautiful spot on earth.

South Seas. You can still live the life of a Tahitian beachcomber—but not in Tahiti, which has found out about the Yankee dollar. Instead, drowse on brilliant Sigatoka Beach at Suva or watch Pacific combers crash on reef-girt Norfolk or Lord Howe Islands. (You can reach the South Seas by freighter from the U. S.)

Africa. Perhaps the biggest travel bargain today is an 80-day luxury cruise around the Dark Continent, calling at a score of colorful ports like Dar-es-Salaam, for \$700, round trip from Amsterdam. (You can reach Holland for \$165 from the U. S.)

Mediterranean. A two-week cruise to Malta, Naples, Casablanca, and Lisbon starts as low as \$92, round trip from London. But try a longer stay—in the lush valleys of Mount Olympus on Cyprus, where a couple can live comfortably for \$1,400 a year; on Aegean islands that hide remnants of a 5,000-year-old civilization among olive and cork groves; or with the fisherfolk of rocky Sardinia, where hotel rates are 24¢ a day or \$1.12 with three good meals.

Atlantic Islands. Green cones standing out of the sparkling waters of the warm Atlantic—these are the Azores and the Canaries. Tropical flowers, sandy beaches, and the charm of old Spain are combined here—with rents of about \$20 a month, groceries for a couple at \$10 a week and servants \$5 a month each.

The vagabond voyager with a fistful of dreams can get aids to planning from these 2 guides:

BARGAIN PARADISES OF THE WORLD.

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dent whole—somewhat like a cell of the human body which, in co-operation with other cells, has its assigned function yet is easily dispensed with if the good of the whole requires its removal. The bees themselves ruthlessly eliminate elements of their interrelated society if the well-being of the colony is adversely affected. The drones, for instance, are dragged forth from the hive when their function has been fulfilled and are left to starve outside its bounds. The first young queen to emerge from her cell frequently stings to death her still unemerged royal sisters, so that the tradition of a single egg-laying member within the colony may not be violated.

Similarly, it may be that from the standpoint of the hive more is gained through the effectual stinging of a would-be invader of the colony, thanks to the special stinging mechanism that the honeybee has evolved, than is lost by the incidental death of the individual inflicting the wound. That a detachable and barbed sting is an especially effective instrument is indicated by the fact that it is anchored in the victim and that the attached poison sack, which the bee loses along with the sting as it tugs to free itself, continues to pump poison into the wound as if it were still part of the living bee. The resulting dose of venom is thus more ample and potent than one administered by a transient sting quickly withdrawn.

While equipping the worker of the honeybee with an instrument that may prove fatal to the individual thus armed, nature takes no chances where the queen is concerned. Her sting is not barbed like that of the worker but is smooth. Moreover she makes use of it as a rule only against a member of her own caste.

It is of interest to note that a barbed and detachable sting is not the possession of the honeybee exclusively. Some social wasps have somewhat similar equipment. This general type of sting has been reported, for instance, in species of *Polybia*, *Synocera*, *Nectarina*, and *Tatua*. Thus a mechanism that gives greater protection to the colony even if it puts in jeopardy the stinging individual has been independently evolved by two suborders of the Hymenoptera: bees of the genus *Apis* and social wasps of the inclusive family Vespidae. The circumstance is the more impressive because the two groups of insects are not very closely related.

Of necessity the barbed, detachable sting is of special service only to a social insect. Solitary insects like the Sphecoid wasps use their sting only secondarily for protection. In their case, the primary function of the sting is to paralyze the insect or spider prey, which the wasp must secure as food for the larvae that will emerge from her eggs.



Egg Chain

Sims:

The strange "oceanic necklace" I am sending you was found on Jones Beach, on Long Island. Can you tell us what on earth it is?

FENLEY HUNTER

Garden City, N. Y.

Our experts in the American Museum's Department of Fishes and Aquatic Biology tell us that this string of parchment-like capsules is what a conch produces when it (or shall we say she?) undertakes to produce a new generation of little conches. It may be a surprise to many that a creature no larger than the occupant of the shell in the accompanying photograph could produce such a chain. We opened one of the capsules to see whether any of the little shells remained inside, as would be the case if the chain had been cast ashore before hatching. However, this string of cases had apparently yielded its treasure before you found it. The small shelled creatures emerge through a hole in the edge of the capsule when they are about the size of grains of sand.—Ed.

Unchoking the Geysers

Sims:

As an inspiration to action, the article "Who Is Choking Yellowstone's Geysers" in a recent issue of *NATURAL HISTORY* Magazine should be awarded a prize.

It brought forward in me such a crusading urge that I set to work at once to interest club women and other groups with a desire to help to the fullest extent to save the geyser basins in Yellowstone National Park from further damage. The National Life Conservation Society at once passed a resolution to work hard for this cause. I introduced a resolution also in the convention of the New York City Federation of Women's Clubs, calling for all possible influence to be used

for education to protect the geysers, and it was unanimously adopted.

Other splendid organizations, including the Natural History Club also took action, and some of the other groups for whose conservation activities I am responsible are arranging to campaign with us. We are trying for an enthusiastic campaign of education.

We also realize that the National Park Service needs many more men than they are now able to employ to take care of our irreplaceable treasures in the geyser basins. Work will be begun on this matter later.

Let's all start the New Year with a determination to work for protection. I had visited Yellowstone Park twice on tours of inspection and have appeared at Congressional hearings, and I know it's a long, hard fight to save the great scenic parks. But your fine article deserves a word of thanks, and let's all keep working on this good cause.

MRS. CHARLES CYRUS MARSHALL,

President

National Life Conservation Society
New York, N. Y.

Sims:

If I am not mistaken, this is my twentieth year of membership in the American Museum of Natural History—20 years of a cordial, most pleasant relationship and a monthly anticipation that has always lived up to its greatest expectations.

Thank you for one of the greatest

Readers are reminded that separate reprints of the covers of *NATURAL HISTORY* are available for 5¢ each, plus 5¢ for postage and handling. Write to Man and Nature Publications, 79th St. and Central Park West, New York City, 24.

antidotes to boredom—NATURAL HISTORY Magazine.

MRS. ARTHUR E. LAMB

From the Executive Secretary of a county medical society:

... I have been a subscriber for the past few months and find NATURAL HISTORY one of the most interesting and enjoyable of the many magazines I read. In fact, I wish it had been brought to my attention many years ago. The study of natural history, as presented in your pages, is a fascinating and engrossing subject—a refreshing change from the strife and uproar of the world today.

SMS:

As a subscriber for many years to your beautiful and truthful magazine, I want to thank you as enthusiastically as I can for your new feature, "The Screen". . .

PHILIP GOLD

Brooklyn, N. Y.

Three Expeditions: 119,000 Specimens and More to Come

Three American Museum expeditions searching for little-known insects and spiders in the Southwestern United States and Mexico have brought back a total of 119,000 specimens. Dr. and Mrs. Charles Vaurie returned recently with about 20,000 specimens from Sonora, Mexico, and the island of Tiburon. Approximately 85,000 specimens were collected by Dr. Mont Cazier, Dr. Willis J. Gertsch, and Rudolph J. Schramel, who traveled 17,000 miles through Southwestern United States and Mexico. John C. Pallister's expedition, previously referred to in this magazine, is credited with over 14,000.

These vigorous strides toward rounding out the American Museum's celebrated collection of insects and spiders are significant in terms of the basic research they will make possible concerning the most numerous class of creatures and the group that is in many ways of greatest concern to man.

In addition, four men have left on a six-month expedition from the American Museum to the Bahama Islands for the purpose of making the first comprehensive collection of insects and reptiles from this area. The expedition, known as the Van Voast-American Museum of Natural History Bahama Islands Expedition will be staffed by Horace S. Van Voast, Jr., co-owner and captain of the 43-foot auxiliary schooner "White Wing," John C. Pallister of the Museum, Ellis B. Hayden, Jr., a graduate student in the Department of Entomology at the University of Kansas, and George B. Rabb, a graduate student in herpetology at the University of Michigan.

Mr. Van Voast and Mr. Pallister will set sail on December 15, and the other two members of the expedition will be

taken on board at Charleston, South Carolina.

"Although isolated collections of insects have been made in the past from a few of the islands in the Bahamas," states Dr. Mont Cazier, Chairman of this department at the American Museum, "the present expedition will result in the first comprehensive survey of the insects of this area."

The 7000-mile trip on the "White Wing" will be the first sailing experience for Mr. Hayden and Mr. Rabb, and it is Mr. Van Voast's first experience on a scientific expedition, though he was an officer in the Navy in the First World War and is a veteran navigator who has his pilot's license. He has an enthusiastic interest in natural history and feels that though the "White Wing" might prove crowded if they were hunting for elephants, it will easily accommodate the thousands of insect specimens the scientists expect to collect.

Mr. Pallister's honorary title of "salt water entomologist" at the American Museum is uncontested, for his permanent home is a 100-foot sea-going yacht from which he commutes daily to the Museum. He has made many expeditions on larger craft, but he describes his sailing experience as "limited."

The field work will be carried on in the Bahamas from Great Inagua and Turks Island in the south to Grand Bahama Island in the North.

For Mr. Hayden and Mr. Rabb, the expedition offers the opportunity to secure sufficient research material for their doctoral theses. Portions of the scientific collections will be given to the University of Michigan and the University of Kansas.

As is Mr. Pallister's custom, he will take with him three cameras and 2250 feet of motion picture film in order to bring back to the Museum a record of the activities of the expedition.

The Screen

Edited by ELIZABETH DOWNES

Since no new motion pictures were released in the natural history field this month, we are carrying only brief comments on films previously reviewed.

DOCUMENTARY AND GRADE A

The Amazing Monsieur Fabre

Life of world-famous naturalist Jean-Henri Fabre

Good insect photography, sometimes erroneously interpreted. Filmed on location in France

Ivory Hunter

One man's struggle to build an African Wildlife Park

Authentic geographically. Marvelous shots of big game. Good conservation

Latuko

Pattern of life of an African tribe

True picture of life in the southern Sudan. Excellent color photography

Water Birds

Disney vignettes from lives of water birds

Superb photography by experts in the nature field and entertaining synchronization of music and bird action

DOWN THE ALPHABET

The Big Sky

White traders attempt to open Blackfoot Indian territory, 1832

Blackfoot Indians portrayed with disregard for fact

The Blazing Forest

Lumber camp operations and fire fighting methods

Should be enjoyed by young people. Accurate picture of a lumber camp

Chee-ak

Eskimo film made in 1930 in Alaska with mostly native actors

Average person's conceptions and misconceptions of Eskimo life. Some fine shots

The Jungle

An extravagant melodrama in which the main characters hunt mammoths in India

Pure fiction seasoned with a sprinkling of natural history and India

The Snows of Kilimanjaro

Story of a writer with a complicated personality

Some splendid African animal shots. Camp scenes unconvincing

Under the Red Sea

An exploratory film with a plot woven in

Rich and varied marine life of Red Sea shown with high photographic artistry. Narration makes false claims

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The temperature may read ideal on a thermometer, but unknown to you, the moisture in the air may be roasting your furniture, camera and other possessions. In today's modern insulated homes, you need a check on the humidity as well as the temperature. Designed with just that use in mind, this instrument shows the "Health Zone" for most efficient work, play and living. Every home, office and shop needs several.

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A desirable outfit if you wish to make your own microscope slides. We offer this assembly of material at a very reasonable price. It consists of slide box for 10 slides, plain slides, glass covers, Canada balsam, forreps, needles, labels, droppers, bottles and cavity slide ALI for only \$2.50 postpaid.

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Famous U. S. Gauge pocket compass made of durable metal, accurate, easy to read. 2" diameter with unbreakable crystal. Excellent for Scouts, campers, magnetic experimenters. Can locate BX electrical cables in walls, fire piping in concrete and cement walls or flooring. Locates iron deposits, minerals and pipes underground, etc. Postpaid 75¢.

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BOOKS

Continued from page 7

ice will find basic concepts effectively explained; diagrams supplement the pictures and text wherever necessary. The amateur with some knowledge of fundamentals will find this an ideal source book. Although theoretical astronomy is carefully avoided, explanations are fully satisfying. The astronomer will appreciate the concentrated assemblage of facts at the beginning of each chapter (listed in both English and metric systems).

Chapter 40, which deals with stars, is preceded by a table of stellar data which is unequalled in publications popularly available. This field of research is so fertile—with many new concepts being evolved—that an up-to-date résumé is most welcome.

For star identification, the authors have presented the usual pole to pole maps and have supplemented them with sketches of guide lines to help in visualizing constellations and individual star locations. This is a tried and effective method of teaching a difficult subject.

Galaxies, clusters, and exploding stars are treated so well as to merit special commendation. In fact, every chapter of the book has been prepared separately for publication in the *Griffith Observer*. Gathered together, these articles represent one of the soundest, most complete, and most readable efforts in the field of astronomy.

JOSEPH M. CHAMBERLAIN

TIBETAN SKY LINES

----- by Robert B. Ekvall

Farrar, Straus and Young, Inc. \$3.50.
240 pp.

TIBET has been a popular topic for book writing in recent years and the emphasis has varied from adventure, so-called, to travelogue and ethnology. Most of these books have been the outcome of visits, some of them quite brief, to Tibet. *Tibetan Sky Lines* is different because Ekvall was born on the border of Tibet, speaks Chinese and Tibetan and is writing as a resident. He knows the region as well or better than any other white man. His training as a missionary and his interest in anthropology give competence to his opinions. The fact that he and his wife and son were accepted as a welcome unit in a primitive community gave him an intimate insight into native customs and philosophies that no casual visitor could hope to attain.

This book is a very readable account of how the Ekvall family moved into Tibet, searched for a place to live, overcame a reluctance to admit foreigners, and eventually won a firm place in the affections of the community leaders. There is considerable space devoted to the details that make the Tibetan mode of life different from that of the Western

world. Local jealousies, fear of outsiders, and adaptations to a rugged environment have all made their impression upon a people who often show an underlying behavior pattern that we associate with childhood.

The author was not in search of adventure. He had set a task for himself, but there were times when he and his family were in some jeopardy. There are no dull pages in this book, the reader interest is well sustained, and there are no tedious digressions. *Tibetan Sky Lines* should stand as the most authoritative as well as the most readable account that has appeared.

It is unfortunate that the illustrations show excessive contrast, chalk and charcoal, and are not up to the high standard of the text.

HAROLD E. ANTHONY

THE AMAZING AMAZON

----- by Willard Price

John Day Co., \$4.00, 306 pages

ALL Willard Price's books I have read have been deftly woven fabrics of the history of a region and Price's own personal adventures and travelogue. In *The Amazing Amazon* the author has again produced a fascinating tale.

He has read widely on his subject. Of relatively ancient Amazonian history, he retells the story of Orellana's discovery in 1541 of the warrior Amazonian women. He brings us up to date with accounts of the two rubber booms and the costly (in human lives) building of the Madeira-Mamoré railroad, which bypasses the great rapids of the Madeira River. He tells what purports to be the true story of the death of Fawcett, the explorer. He has chapters on jungle life, river life, Amazonian town life.

When he comes to natural history, he is rather less fortunate. He evidently strives (perhaps strains, or stretches would be a better word) for maxima. His otters become 10 feet long, his anadons 50 to 60 feet. And what in the world are "river seals"?

He has the botanist Spruce finding a milkwort that climbed to the tops of the tallest trees, periwinkles 40 feet high, violets the size of apple trees, and members of the daisy family as big as alders. "The verbenas forms a spreading tree like a horse chestnut." But Price neglects to point out that the words milkwort, periwinkle, and violet are used in a very loose sense to mean relatives of or plants in the same family as the violet, periwinkle, and milkwort—a very misleading way of telling the facts.

The author concludes with highly optimistic predictions about the future of Amazonia.

There are three pages of bibliography and an index.

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MARCH—An arresting study of two defiant ospreys. These interesting bird fishermen are known throughout the U.S. but are seldom seen so well as in this dramatic close-up.

APRIL—Hedgehog cactus in bloom—a brilliant specimen of botanical photography, masterly in its beauty of color, detail, and composition.

MAY—The Great Organ Butte. One of Nature's most impressive monuments, this inspiring monolith towers in majesty and serenity against the cerulean sky and tawny desert of Eastern Utah.

JUNE—An appealing study of a little orphaned mule deer, his wobbly legs, shiny nose, enormous ears, and spotted coat enveloped by the green leaves and purple flowers of his natural habitat.

JULY—A mother goldfinch, as big as life and a lot closer than usually seen, stands guard over her clamoring offspring, with yellow and black plumage vividly silhouetted in natural surroundings.

AUGUST—Grace, freedom, and beauty as exemplified by a blacktail deer in Nature's own frame of muted colors, with famed Devil's Tower soaring against the Wyoming sky.

SEPTEMBER—A tree toad, of all things! This comical little fellow, though seldom seen, is beloved by all for his bucolic serenades on warm spring evenings. Here, glistening amidst bright red berries of the Black Alder, he proves he should be seen as well as heard.

OCTOBER—Shades of autumn. Who has words to match the beauty of trees in the fall? This scene of a meadow in the Catskills is a bit of transitory glory captured for unending enjoyment.

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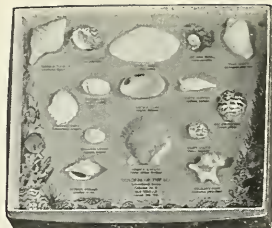
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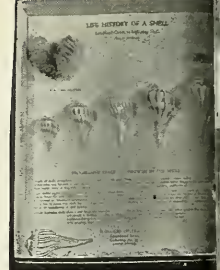
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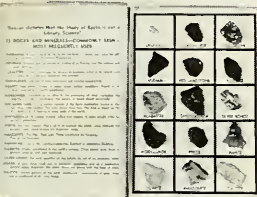


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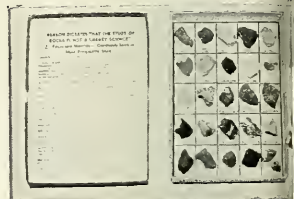
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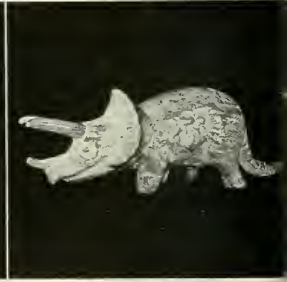
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▼ THE TROTTER. His right front and left rear legs move forward at the same time, then the other pair do likewise



United States Trotting Association Photos

LETTERS

How Do They Run?

SIRS:

I am much interested in the statement in a recent issue of *NATURAL HISTORY* that the hyena paces when it runs.

I have long had the idea that the giraffe paces and that no other animal does. I would much appreciate it if you could enlighten me further.

HERBERT R. SPENCER

Erie, Penna.

The following information is offered by George G. Goodwin of the American Museum's Department of Mammals:

Everything about the motion of wild creatures is interesting. Indeed, life itself is interesting to us chiefly because of our own capacity for motion. Of absolute rest, nature gives us no clue; and man's emotional balance is easily disturbed by hindrances to normal motion. Inactivity breeds loneliness and despair; movement means life and brings a sense of well-being and hope.

All matter, whether living or dead, is constantly moving, but the casual observer finds the greatest interest and meaning in the intelligent and often graceful movements of the higher animals.

Animals first crawled out of the water, dragging their bodies on the ground. Later they rose up on their legs to walk; in time, they increased their walking to running, and some of them eventually took to galloping. Air, water, and land are the three great highways of our universe. Various animals travel each of these highways with perfect ease and comfort, and on each highway there is a wide range of intergrading forward motion.

Among the mammals on land there are those that climb, glide, walk, run, jump, and gallop, animals that scurry along, and some that move in slow motion. It

might be said that in ordinary running the four-footed animals "roll" along, the leg being the spoke of the wheel. The foot is like the rim of the wheel, except that it only touches the ground intermittently. The difference is that the legs of the horse do not go up and over. However, they get there just the same.

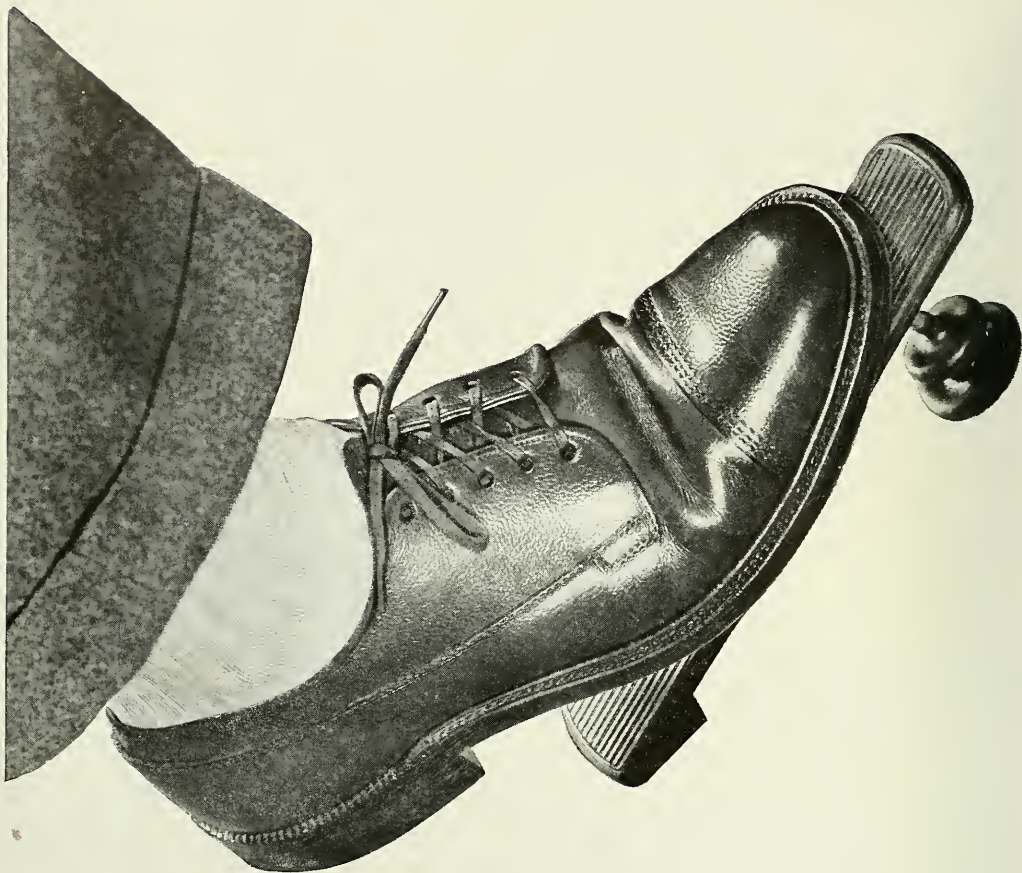
If you look down on most four-footed animals from above, their legs are seen to move in diagonal pairs—that is to say, the front right leg and the left hind leg move forward together, alternating with the left front and the hind right. This also holds true of ourselves: as the right leg moves forward the left arm swings forward, followed by a similar action of the right foot and left arm. In this diagonal movement of the limbs, the body twists or weaves forward with an even continuity of movement.

The diagonal gait of the hoofed animals can be separated into three separate speeds: walk, run (or trot), and gallop. In each of these gaits, one or more feet

are almost always touching the ground. If this were not the case, conformity of motion would be broken, resulting in loss of speed. Exceptions are found in the leaping or bounding gallop of the springbok and certain other animals. There is no doubt that this diagonal motion of the limbs is the most efficient method for travel on land, yet not all mammals progress in this fashion. A few amble or pace. In these the fore and hind legs on one side move forward together, first on one side, then on the other. Why some animals have adopted this method of travel is difficult to explain. It impairs the continuity of motion and breaks down efficiency in speed.

This gait known as pacing is evidently hereditary and has been handed down from a distant geological age. It is not known if pacing was a general practice among primitive mammals or if it was restricted to a few groups, as it is today. Animals that pace have their bodies slung high on the legs, but they are not

Continued on page 94



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THE COVER THIS MONTH

This remarkable color photograph of a number of mushrooms at the foot of a tree was taken in Maine by Helen Cruickshank, the well-known nature photographer, whose husband has entertained so many audiences for the Audubon Society with illustrated lectures.

The growth and reproduction of mushrooms can be studied by almost anybody, yet one will never exhaust their variety or lose the hope of finding another rare or even unnamed species. The ease with which color photographs can now be taken makes this group of plants especially popular. Though their shady haunts sometimes present problems of illumination, the cameraman will thank the mushrooms for their willingness to remain motionless, recalling that even the flowers have a tendency to nod in the wind and blur the image.

To sense the possibilities of three-dimensional photography, as well as to learn a great deal about mushrooms, the reader is referred to the book *Mushrooms in their Natural Habitats*, by Alexander H. Smith of the University of Michigan, in which 231 outstanding stereopticon pictures are included, along with an instrument for viewing them.

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Edward M. Weyer, Jr., Editor

February, 1953

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From a color photograph by Helen Cruickshank

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EXPLORING NATURE WITH YOUR CHILD

by Dorothy Edwards Shuttlesworth

Greystone Press, \$3.95
448 pp., 140 illus.

A NEW and different nature book has been written by Dorothy Edwards Shuttlesworth. It is not a text or guide book in the usual sense, but a selected background to nature in its many forms. In particular, it is a book for thoughtful parents, making available a rich treasury of information to share with a child. At the same time, it is by no means limited to parents. Older children and other adults will find it extremely interesting and difficult to lay aside, once they open it. Anyone who likes nature will find himself turning to it again and again.

Exploring Nature with Your Child fits a niche that is more general in substance and broader in scope than any of the specific guide books. It takes the reader on a surprisingly inclusive tour of the world of nature, especially those phases that fascinate and arouse the interests of a child. To quote the author, "An inquiring mind and zest for living are essential for a rich, interesting, and worth-while life. Childhood is the time to nourish and strengthen these fine qualities." Dorothy Shuttlesworth has done an excellent job of supplying the necessary material for this task. The fact that she is the mother of two children and that she founded *Junior Natural History* Magazine, (published by the American Museum of Natural History) and has been its editor for the past sixteen years, gives her unique authority and qualifications to write this book.

A book crammed with such a variety of information is not easy to summarize. The chapter headings give only a partial idea of the subjects covered. For example, chapter four, "Birds of Farm and Zoo," touches on turkeys, homing

pigeons, ostriches, canaries, and even flying reptiles and the earliest known bird. Other chapters include domestic and wild mammals, fish, reptiles and amphibians, insects, plants, astronomy and weather. Ways of observing various wild things, and of collecting and keeping certain kinds such as birds' nests, leaves, and live insects are but a few of the topics discussed. Of course, none of these individual items are treated in great detail. That would be out of the question. But each chapter contains such a rich store of them that the author more than answers the questions most likely to be raised and at the same time stimulates a lively interest in nature. Having written it with the parent in mind, Mrs. Shuttlesworth frequently adds amusing sidelights and bits of background philosophy.

It is true that *Exploring Nature with Your Child* is not sufficiently detailed for advanced students or amateur naturalists. For them there are a host of books on specific subjects such as birds, trees, and the like. But for the beginner, and especially for the parent anxious that his child secure an accurate, well-rounded knowledge of the world around him, this book is the answer to a real need. It has an unusual and most attractive format, each topic-caption being set in colored ink, with many two-color drawings and full page photographs. *Exploring Nature with Your Child* can be recommended without hesitation.

WILLIAM C. HASSLER

A BRIEF HISTORY OF THE ART OF NAVIGATION

by Louis Allen Harding

The William-Frederick Press, \$3.75
142 pp., 66 illus.

GOOD reading here for everyone interested in the interrelation of astronomy, time keeping, navigation, and geography. In outlining the progress of

navigation the author describes the many ways man learned about the earth through observing the behavior of the heavenly bodies. The story of early navigation instruments and their use is excellent and well illustrated with line drawings. The book emphasizes the many difficulties that faced the navigator before astronomy had advanced sufficiently and accurate instruments were invented.

There are some technical errors, a few of which may be due to careless proofreading. These, however, can be easily corrected in a second edition, at which time an index should be added.

On the whole, this is a worthy contribution to the history of navigation and should appeal to anyone with the slightest spark of curiosity about his world.

ROBERT R. COLES

OUR AMAZING BIRDS

by Robert S. Lemmon
Paintings by Don R. Eckelberry

The American Garden Guild and
Doubleday and Co.
239 pp., 102 drawings

WIDE popular interest in birds encourages an amazing variety of books, ranging from the formal check list bristling with Latin and Greek to the personal accounts of experiences with particular birds. Somewhere in between stand the manuals for bird-watching, intended to name almost any bird one may see and to provide salient facts of distribution and behavior.

The number of illustrations required in a handbook forces a bird artist to keep them small and to crowd them together. It must have given joy to Don Eckelberry to draw pictures for this handsome volume, with text by Robert Lemmon, for they could be given so much more room and individuality.

Mr. Lemmon contributes a series of essays on 102 species of North American

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birds, chosen from as many orders and families as possible and then presented in no particular order at all. The series begins with a hummingbird and the great auk, and terminates with the Blackburnian warbler and downy woodpecker. An albatross soars between the bluebird and the crow, the skimmer plows water between a marsh wren and the robin.

To the uninitiated this may prove somewhat confusing, but there is a great deal of reliable information in the book, and the index makes it easy to find any species of immediate interest. It is a disappointment to find albatrosses in general called "flying cruisers of the warm-water oceans"; most of them require cool waters. Many of the descriptions of behavior are too strongly tinged with human emotions.

Nevertheless, one may open the book anywhere and be sure to find a pleasing account of the ways of some well-known bird, or perhaps of one that has unfortunately disappeared from our land. Even after all the printed pages have been read, Don Eckelberry's drawings will tempt one to come back again and again.

JAMES P. CHAPIN

THE FACE OF THE ARCTIC

by Richard Harrington

Henry Schuman, \$6.00
369 pp., 161 illus.

RICHARD HARRINGTON went into Canada's Northwest Territories as a documentary photographer with an assortment of cameras and plenty of film, plus artistry, enthusiasm, adaptability, insight and integrity; and in an eloquent combination of words and pictures he has told in *The Face of the Arctic* what he saw and heard, did and thought during his several winter and spring journeys since 1949 in the region between Coronation Gulf and Hudson Bay.

His photographs are among the best ever made in the Canadian Arctic. They include such rare shots as one of a couple of dog teams leaving a vapor trail over the sea ice in very cold weather, and innumerable sensitive illustrations of northern life, indoors and out, day and night, under all conditions. As one whose own experience with cameras in the North goes back many years, in winter as well as summer, this reviewer can feelingly testify that it takes a lot of determination deliberately to freeze your fingertips for the sake of a picture when you are chilled and tired and hungry. Harrington's book shows that he has done that often, although he says, "Many times I passed up excellent possibilities, because I was just too damned cold."

More than half the book covers his

visit to the settlement of Coppermine and his inland and coastal sled trips with a Royal Canadian Mounted Police constable and with Eskimos, in 1949. The balance chronicles his travels on the west side of Hudson Bay and northward to Boothia Peninsula, in 1950 and 1951—altogether three separate excursions into the North rather than the five stated in the publisher's subtitle in apparent reference to earlier journeys recalled in the text but not described.

The text of *The Face of the Arctic*, which has no pretensions of scholarship and seems to be based largely on diary entries, presents a factual and absorbing cross section of the manners, customs, and environment of the whites and Eskimos Harrington met from Coronation Gulf to Hudson Bay.

RICHARD FINNIE

AUDUBON'S BUTTERFLIES, MOTHS AND OTHER STUDIES.

Compiled and edited by Alice Ford

Studio Crowell, \$5.75, 120 pp.,
40 plates (17 in color)

THIS book presents for the first time a series of sketches by the renowned John James Audubon on insects and reptiles. They were done in a sketchbook in the early 1820's and presented to Mrs. Charles Basham of Pittsburgh in 1824. They remained in that family for four generations but have now been made available to the public through the courtesy of Mrs. Kirby Chambers, their present owner.

The text gives a brief background on the truth and legend of Audubon's birth and traces the history of this sketchbook. The main part is concerned with the period of Audubon's life when he was living and sketching in the lower Mississippi country. A number of very interesting episodes and observations are presented, including his meetings with other artist-scientists of his era. It also presents information on his companions and assistants, principally Maria Martin.

These insect drawings were done at a time when practically no entomological illustrating, or even writing, was being done in this country; they are contemporary with the work of Thomas Say, known as the father of American entomology. Many of Audubon's insect sketches are quite good, and the species represented can be recognized and classified; others, however, are more impressionistic or symbolic. The insects and reptiles are all done very painstakingly as aqueous drawings or washings.

In addition to these insect, spider, and reptile drawings, a selection of Audubon's bird paintings of the same period and region are given. Also there are insect drawings by some of Audubon's contemporaries and his assistant, Maria Mar-

tin. The pictures by the latter show her to be an excellent entomological artist, better in fact than Audubon himself in this field.

A good bibliography is given for the subjects covered, and the index, for both text and illustrations, is very complete.

FREDERICK H. RINDGE

THE STORY OF TREES

----- by Ferdinand C. Lane

Doubleday and Co., \$5.00
384 pp., 36 illus.

NO matter how much one knows about trees, the reader of this book will almost certainly discover facts unknown to him, and this information will be conveyed in such an interesting fashion that it is hard to lay the book aside.

Lane has done a scholarly piece of work in compiling from a voluminous source everything having to do with the history, development, and use of trees. Despite the encyclopedic coverage of the subject, the treatment is not dull, and the reader-interest does not flag.

The broad general subject of trees is treated under a variety of categories. Each special aspect of the subject is a well-rounded presentation in itself, in factual content and interest, and can furnish non-soporific conversation topics to a surprising degree. Also there is a continuity of theme, which brings all the varied approaches with their diverse data into a harmonious and well-balanced whole.

Trees have a long and illustrious history, a fact that brings appalling and disturbing reflections if one realizes the era of trees upon this earth may be in its final phase unless steps are taken to check the ravages of disease and the wasteful practices of man. With respect to trees, history will not repeat itself.

It is a fascinating process whereby trees make use of chemical and physical laws to develop from a tiny seed the vast structure of the mature organism. Trees are hard at work if only we stop to consider; the energy that has gone into the making of a giant redwood must be of great magnitude.

Trees have played a prominent role in man's culture, and he would be greatly handicapped if he should have to get along without them. All of the implications of this statement are developed in this book, from the obviously practical to the aesthetically inspirational.

The quotations heading each chapter and the half tone illustrations add to the appreciation of the text.

HAROLD E. ANTHONY

A FIELD GUIDE TO SHELLS OF THE PACIFIC COAST AND HAWAII

----- by Percy A. Morris

Houghton Mifflin Co., \$3.75
220 pp., 48 pl. (6 in color)

THIS is a beginner's book, a handy volume easily carried in the pocket by the stroller on the shore whose eyes have been diverted from wind and wave to the gems cast up by the sea. It is by no means an exhaustive manual of West American and Hawaiian mollusks, but a treatise that will answer the question "What is it?" for the rank and file of beachcombers who eventually may be stimulated to more serious study of mollusks.

Unlike previous efforts of the kind, the author is aware of the public's picture-mindedness. The 48 plates depicting 608 kinds of shells, 116 of which are in full color and the rest reproduced from fine photographs, will prove the most used part of the volume.

The text is simple and to the point. The introduction will be stimulating to the individual desiring to know more about mollusks than merely picking them up as he strolls on the beach. One thing here should have been added; namely, that an endless lot of minute shells can be found at the high tide line of the shore or among the flotsam and jetsam deposited there, which may be gathered with a spoon, bagged, and taken home to be sorted at leisure.

The up-to-date scientific names accompanying the brief description show the help the author has received from that indefatigable West American mollusk

enthusiast, John Q. Burch. It is regrettable that the author did not avail himself of similar help in dealing with the Hawaiian species.

This little volume, which is the sixth in the Peterson Field Guide Series, meets a long-felt want, and I heartily recommend it.

PAUL BARTSCH

AFRICAN FOLKTALES AND SCULPTURE

Folktales selected and edited by Paul Radin in collaboration with Elinore Marvel, with an introduction by Paul Radin. Sculpture selected, with an introduction, by James Johnson Sweeney. Bollinger Series XXXII, Pantheon Books, \$8.50, 355 pp., 165 illus.

THE first thing that should be said about this magnificent book is that it is a bargain: 81 folktales and 165 large plates of superb examples of African sculpture handsomely printed and reproduced for \$8.50! The folktales representing African oral literature were selected by Dr. Radin from all parts of Negro Africa and present a comprehensive view of the range and character of this form of expression. The sculpture is drawn from a more limited area, primarily from the regions of western and central Africa where the plastic arts for some unknown reason reached a far higher level than elsewhere in Africa.

Although any reader might feel grateful for having both these aspects of Negro art offered him for his enjoyment, I confess I could find no obvious reason why they should be combined under one cover. The folktales do not illuminate the sculptures, or vice versa. Let us, however, not look so splendid a gift horse in the mouth.

H. L. SHAPIRO

THE WORLD OF NATURAL HISTORY

----- by John Richard Saunders

Sheridan House, \$5.00
321 pp., 64 plates

LIKE the great museum around which the author weaves his narrative, this book contains an amazing wealth of information about the earth and its inhabitants. Yet its central purpose is to tell the story of the founding of the American Museum of Natural History and of its growth to the greatest institution of its kind in the world, with the thousands of fascinating exhibits that are to be seen within its halls.

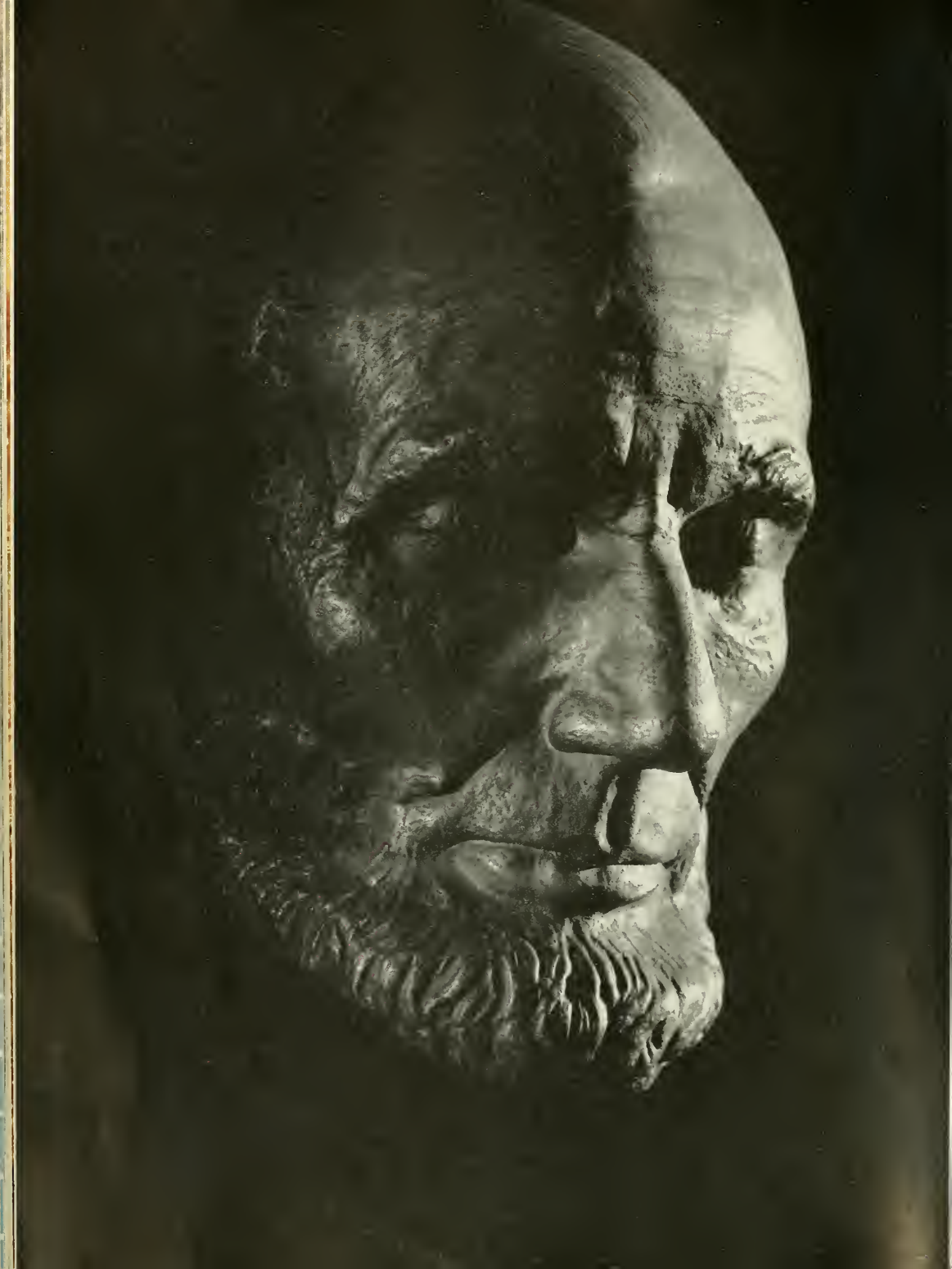
From the very beginning, the Museum has been the product of the inspiration and devoted labors of various individuals. Starting with the determined efforts of

Continued on page 93

Octopus in Your Lap

It is amazing how narrow a crack an octopus can squeeze through. I once knew a naturalist who caught a fair-sized octopus, a foot or so long, and took it into a street car, safely confined within a wicker basket. Ten minutes later a scream came from the other end of the car. Sure enough, the creature had squeezed through a half-inch crack and was sitting on the lap of a hysterical passenger.

From *The Living Tide* by N. J. Berrill
(Dodd, Mead & Co., 1952.)



Was Lincoln A "Mountaineer"?



An exact replica of his face taken just two months before his assassination provides a fortunate basis for measurement and study

By HARRY L. SHAPIRO

*Chairman of the Department of Anthropology,
American Museum of Natural History*

ALTHOUGH much has been written on the subject, it is still a debated question as to how much the physical guise of a man can tell us about his background and character. Certainly not everything, but sometimes perhaps a great deal. No one, for example, has ever commented on how much Abraham Lincoln embodied in his tall, gaunt figure, with its cadaverous face, the type we have come to recognize as the Southern Mountaineer. But the more we think about it, the more striking the resemblance becomes. Perhaps, in ways we haven't appreciated, Lincoln was more a product of the Kentucky hills where he was born and of the people that first settled there than we realize.

One day about a year ago I had an opportunity to examine the little-known life mask illustrated on these pages. An exact replica of this sort provides a close ap-

proach to exactitude in some of the measurements that form the basis of classification in the science of physical anthropology. In other words, the mask could give us a much more accurate anatomical knowledge of Lincoln's face than all the many photographs, portraits, and sculptured likenesses.

This life mask was cast from a mold made on Lincoln's face by a sculptor named Clark Mills 60 days before the assassination. Since Lincoln was shot by Booth on the night of April 14, 1865, it must have been made sometime around, if not precisely on, February 12 of that year, when he was exactly 56 years old. Whether this coincidence means anything, the records I have seen do not make clear. It is indubitably the last mask ever made of Lincoln's face in life and represents him at the height of his career.

This replica of Lincoln remained in the hands of Mr. Mills' sons until 1886 when it came into the possession of Mr. John Hay, Lincoln's secretary and later Secretary of State in Theodore Roosevelt's Cabinet. Apparently it was cast both in plaster and in bronze. The only

bronze in existence is the one shown here, which now belongs to Clarence Hay, through whose courtesy it is reproduced. About three years after John Hay acquired the masks, another plaster copy drawn from the same molds was presented to the Smithsonian Institution.

Physically, Lincoln was one of the most distinctive presidents in our history. His towering height alone might have been enough to draw attention to his physical presence. But this, combined with his extreme linearity, his unkempt appearance, his tousled hair and unusual face, focused extreme interest on his appearance and furnished the political cartoonists with a natural for caricature. Thus, long before the Atlantic shore and Washington knew him, his physical reputation had preceded him. Consequently many of the newspaper accounts of his first visits to eastern cities and numerous memoirs of the period contain an undue emphasis on the appearance of the president from the Wild West.

One of the most microscopic descriptions of Lincoln can be found in William Henry Herndon's

THE ONLY BRONZE in existence from the Clark Mills life mask, taken on or about Lincoln's fifty-sixth birthday. Reproduced through the courtesy of Clarence Hay, to whom it now belongs

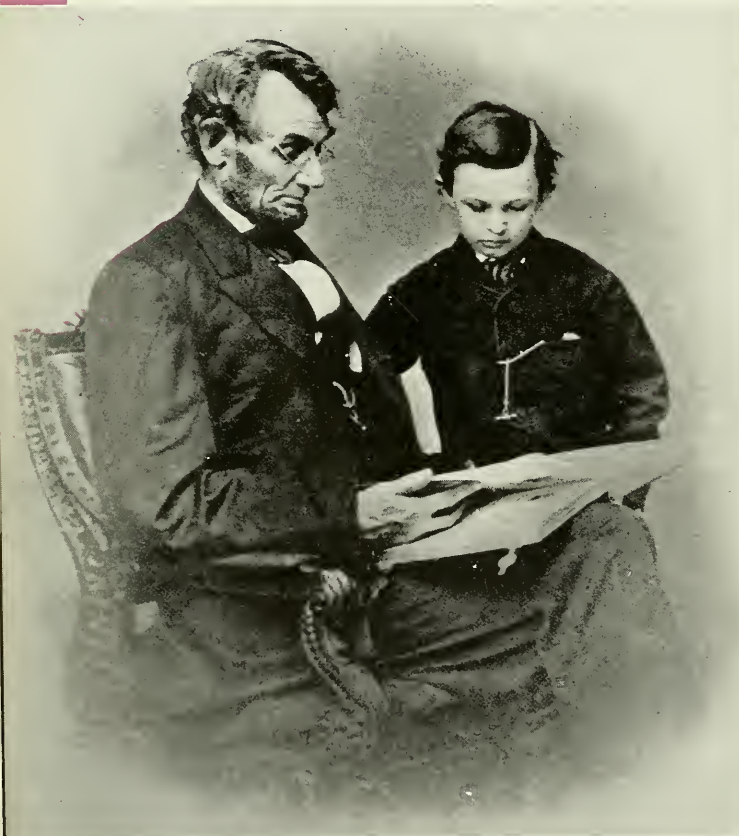
AMNH photo



▼ LINCOLN with his son (Tad) Thomas, photographed in Washington by Matthew Brady on February 9, 1864

▲ THIS ROTATING VIEW of the Mills bronze probably gives a more exact impression of

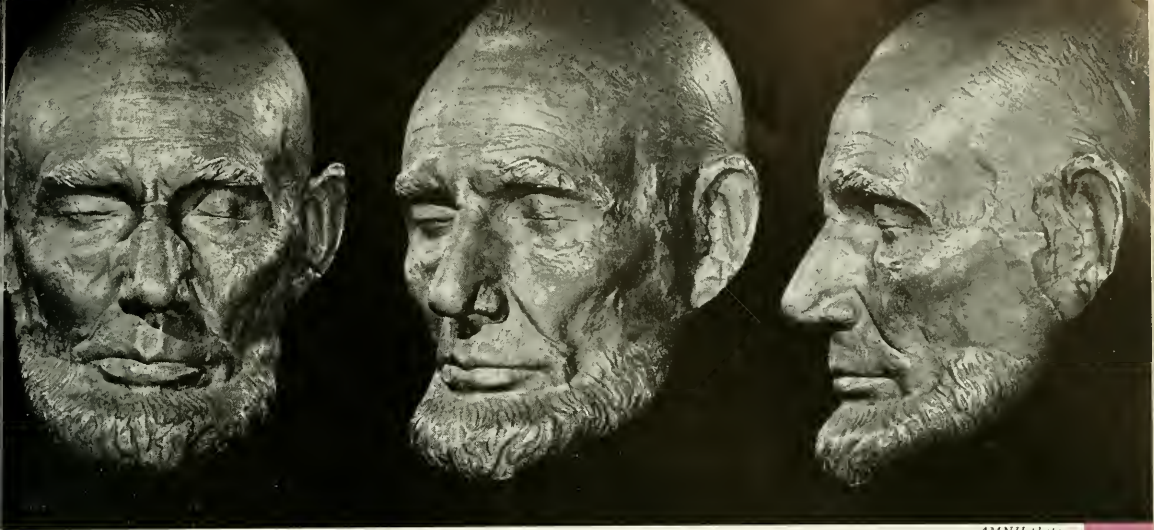
Brown Bros.



papers, recently published. He was Lincoln's law partner and, becoming aware of his genius long before it was generally acknowledged, used his abundant opportunities to subject Lincoln to a minute scrutiny that recalls the devotion of Boswell to Johnson. Herndon described Lincoln as having a long head with a "tall" forehead, sloping backward. The forehead, he adds, was narrow but high; "the cheek bones were high, sharp and prominent; his jaws were long, up-curved and massive, looked solid, heavy and strong; nose large, long and blunt, a little awry toward the right eye; chin, long, sharp and uncurved; face long, narrow, sallow and cadaverous . . . having on his face a few hairs here and there; cheeks leathery and saffron colored; ears large and jutting; lower lip thick, hanging undercurved or down-curved; little gray eyes."

Some of these observations were sound and are borne out by a comparison of measurements taken on the mask with the averages we have of typical old-time Americans of similar north European origin. Others are not.

We have only one considerable



AMNH photo

e anatomy of Lincoln's face than any
production previously published

▼ THE ANGULARITY of his frame and the cadaverous quality of his features
have helped to make Lincoln's likeness so clearly remembered by so many

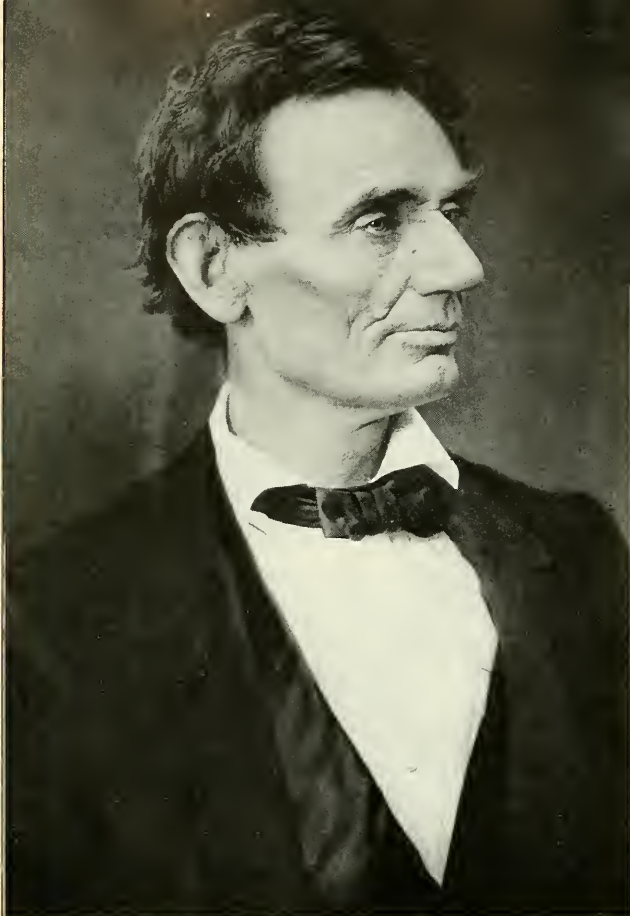
Culver Service

body of information on the faces of Americans whose ancestry resembles what we know of Lincoln's. This is Ales Hrdlicka's measurements of 727 white Americans whose parents and grandparents had all been born in the United States. On the average, these families had probably been in this country for at least 150 years. Most were from the eastern part of the country and represent, so far as we can judge, a constituency similar to the one from which the Southern Mountaineer received his ancestry.

Perhaps one of the most distinctive features of Lincoln's face was its great breadth, emphasized by the jutting arch of his cheek bones. The actual width of the face is distinctly greater than the norm of these "Old Americans" of Hrdlicka. It falls, indeed, near its upper limit, as shown in one of the accompanying diagrams. The lateral projection of the cheek bones was so prominent it made the cheek below it look hollow by comparison, thus giving the "cadaverous" look so frequently noticed.

The hollow, sunken-cheek appearance was further emphasized





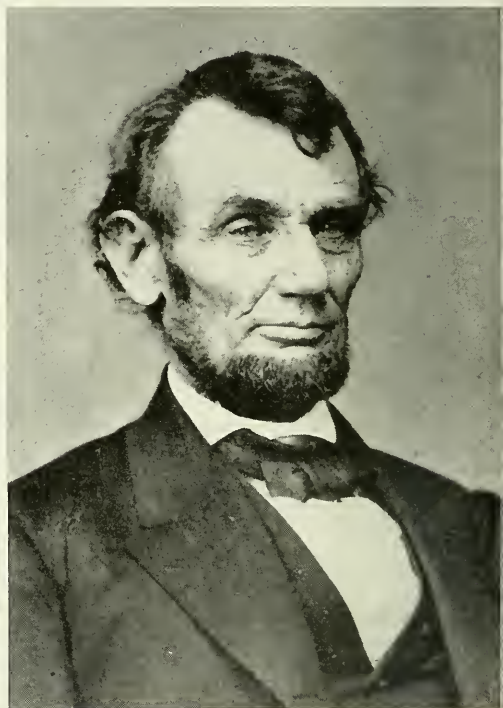
Brown Bros., by Alexander Hesler

▼ LINCOLN towered above his officers: a photograph taken on the battlefield at Antietam, October 2, 1862. His stature is believed to have been six feet, four inches

Brown Bros.

ONCE it is pointed out, could anyone doubt that Lincoln would look at home among the mountain types we associate with his native Kentucky? Note the change that took place in no more than five years between these two pictures

Culver Service



by the enormous width of Lincoln's jaw at the angle just below and forward of the ear lobe. This—the bigonial width—measures 126 millimeters and lies at the very extreme of variation found in the Old American faces. The bony structure of the face was thus wide, both at the cheek bones and particularly the corners of the lower jaw—two elevated ridges with the intervening cheek the valley between them. These peculiarities account for the frequently mentioned angularity and prominence of the bony structure of Lincoln's face observed by so many of his contemporaries.

It is, of course, extremely hazardous to attempt to account for these exceptional features without far more information than we now possess. Almost every face departs from the average in one respect or another—and Lincoln's facial architecture may represent nothing more than a familial inheritance of an unusual combination of characteristics. It is, however, interesting that among the racial strains to be found in Lincoln's geography, one could match these dimensions easily only among Indians.

Herndon was wrong, however, in describing Lincoln's forehead as narrow. It is definitely broad, much broader than the average of Hrdlicka's Old Americans. It was also "tall" and with a distinct slope.

The nose is long, but this length no doubt was in part the result of the marked linearity of growth so evident in Lincoln's whole conformation. The marked length of the nose gives its moderate width almost the appearance of narrowness. The relative width of the nose (nasal index) falls below the Old American average.

Lincoln's face was long in absolute dimension and exceeds the mean. But its length lay largely in the mid-facial region and particularly in the nasal area. The chin was not especially deep from the mouth down. The impression of strength and massivity that Herndon noted probably arose from the great width that I have previously stressed.

LINCOLN'S MEASUREMENTS compared with "Old Americans"

These graphs show Ales Hrdlicka's measurements of 272 Americans, whose family origin was comparable to what we know of Lincoln's

- ↓ Lincoln from the Mills mask
- ↓ Lincoln from the Volk mask
- ↓ Both masks the same

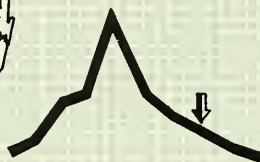


HEIGHT



Lincoln was 7 1/2 inches above average

FACE WIDTH



Exceedingly wide at the cheekbones

FOREHEAD HEIGHT



His forehead was high and sloping

BIGONIAL WIDTH



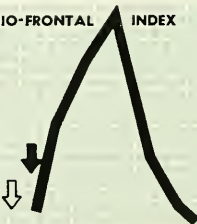
A jaw rarely matched in width

FACE HEIGHT



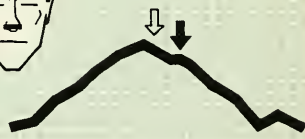
Face long, especially above mouth

GONIO-FRONTAL INDEX



Jaw overbalanced wide forehead

NOSE WIDTH



Actually wide, but not relatively

MINIMUM FRONTAL



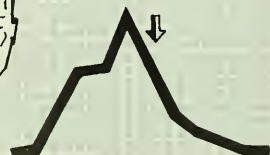
Herndon wrongly called forehead narrow

NOSE HEIGHT



Length of nose eclipsed its moderate width

MOUTH WIDTH



Wide compared with "Old Americans"

EAR LENGTH



Ears long and protruding

In several places Herndon mentions Lincoln's lips. The lower is distinctly fuller than the upper, being about twice as thick, with a slight downward curve, or eversion. Its fullness is emphasized by the long thin upper lip. The mouth, compared with Hrdlicka's Old Americans, is wide, and the ears are long. The cast also supports Herndon's comment that the ears were prominent and stood out from the head.

One of Lincoln's best-known characteristics is his height. Herndon recorded his stature as 6 feet 4 inches, although other sources mention 6 feet 2 inches. He was a tall boy throughout his childhood and adolescence. At sixteen, Richardson remembered him as 6 feet, and at 17 he was said to have been 6 feet 2 inches. It is very likely that Herndon was correct in giving Lincoln 6 feet 4 inches in maturity if he were already 6 feet at sixteen and 6 feet 2 inches at 17. His weight in maturity seems to have ranged from 160 to 180, the latter figure in his later days.

If we had no other descriptions than these of Lincoln's bodily build, it would be obvious that he was an extremely elongated and linear type. Here is how Herndon pictured him: "Thin, wiry, sinewy, raw and big heavyboned, thin through the breast to the back and narrow across the shoulders." Herndon goes on to say that most of Lincoln's excessive height was in his legs, for when he was seated he did not appear tall. In another place, he writes that Lincoln had big hands and feet, characteristics noted by many others as well. Although Herndon definitely says that Lincoln was not muscular, here he is contradicted by Lincoln's boyhood friends, who remembered him as powerful and strong, famous for his prowess with ax and in wrestling.

All these details would be ample to convince a somatotyper, using the Sheldonian classification of body build, that there was a body high in the ectomorphic component and certainly low in endomorphy.

Students of body build or constitution who claim that each of the three basic components of body structure—endomorphy (fat), mesomorphy (muscle and skeleton), and ectomorphy (nervous tissue)—is characteristically associated with specific types of personality, might feel justified in tracing Lincoln's well-known melancholy, his lack of interest in food or liquor, his abstraction, "secretiveness," and withdrawal to this marked development of "ectomorphy" in his physical composition. But I am not sure what they would do with his equally well-known love of company, his story-telling, his joy in debate, his patient, even temper that hardly anyone ever saw ruffled. These, according to formula, don't belong with dominant ectomorphs.

How did Lincoln come by this tall, leggy, gaunt frame? His father, Thomas, was nowhere near like this. Recollections of Thomas, gathered years after his death, vary somewhat, but most of them agree fairly well. He was a man of average, or only slightly greater than average height, perhaps 5 feet 8 inches or a shade more. He was muscular and heavy-set, and one informant said he weighed 180 pounds. If heredity accounts for our physical characteristics, Lincoln's bodily conformation would appear to have owed relatively little to his father's influence.

Nancy Hanks, Lincoln's mother, was however very different from Thomas. John Hanks remembered her as tall, slender, dark-skinned, with a sharp, angular face and a "big" forehead. Another reported a pale complexion, dark hair, sharp features, high forehead, and bright, keen gray or hazel eyes. Dennis Hanks, her nephew, who didn't think much of his infant cousin Abraham when he saw him shortly after his birth, recalls Nancy as "spare-made," 5 feet 8 inches, and weighing 130 pounds. Everyone who remembered her at all spoke of her exceptional intelligence. Lincoln's father, on the contrary, never made any impression of intellectual ability.

These characteristics of Nancy suggest a strong resemblance between mother and son. Lincoln himself seemed to have sensed this special bond with his mother, for Herndon reported that Lincoln confided in him that he owed all he was to his mother. This has ordinarily been taken to mean that Lincoln here acknowledged the moral influence of his mother, but it may well come from his recognition of all that he inherited from her. Nancy was spare and for a woman very tall; Abraham was tall and gaunt. Nancy had sharp prominent features; Abraham had a rugged and bony face. Nancy had a high forehead; so had Lincoln. Nancy was noticeably dark; Lincoln was described by Herndon as having a dark skin—"saffron-colored." Lincoln's gray eyes are not diagnostic here since both his mother and father had light eyes.

It would appear that all the efforts of genealogists and historians to trace the secret of Lincoln's character in his paternal lineage have been ill-advised. How often biographers confuse name-lineage with genetic-lineage, forgetting that the mother's line is just as important in heredity as the father's! Unfortunately, in Lincoln's case little is known about the Hankses. They were in many respects typical of the frontier they lived in. Nancy herself was born out of wedlock and her father is not known. Lucy Hanks, her mother, had come from Virginia as did the Lincolns, following the Wilderness Trail to Kentucky.

The Lincolns were supposed to have been derived from Scotch-English stock, although the genealogy is not too well documented. One tradition traces them back through Virginia, Berks County in Pennsylvania, Massachusetts, and ultimately England, while another brings them directly to Virginia from England. The origin of the Hankses is unknown. But both these families had been frontier families and had been for several generations moving in a stream of population that was made up mainly

Continued on page 90

"I GOT IT! I got it!" cried Bob Turner, my cameraman, as we bounced up and down on the rough sea aboard my sport fishing cruiser, the "Miss Texas." We were somewhere in the junction of the Humboldt and Equatorial currents off the extreme western coast of Peru.

We had been stalking a giant whale for some time in the hope of photographing one of its magnificent jumps. By jumps, I mean the action of hurling its great hulk completely clear of the sea and falling back into a fountain of foam—a very exciting picture. Whales do this, even though many people can't believe it, and I wanted photographic proof. But I'm getting ahead of my story.

To begin with, whales—the largest creatures on earth—have fascinated me for years; and I had good reason to suspect that the kind of photographs we were trying to

Unique photographs reward an outdoorsman who brought patience and special camera techniques to bear upon one of the most magnificent demonstrations of the animal world

take had rarely if ever been procured by anyone before. I think it is impossible for a man who loves the sea, and who is as closely associated with it as I am, not to be fascinated by these great denizens of the deep. The whales of Peru have particularly interested me ever since my good friend Enrique Pardo of Lima told me how his crew once became greatly upset over their experience with a white whale.

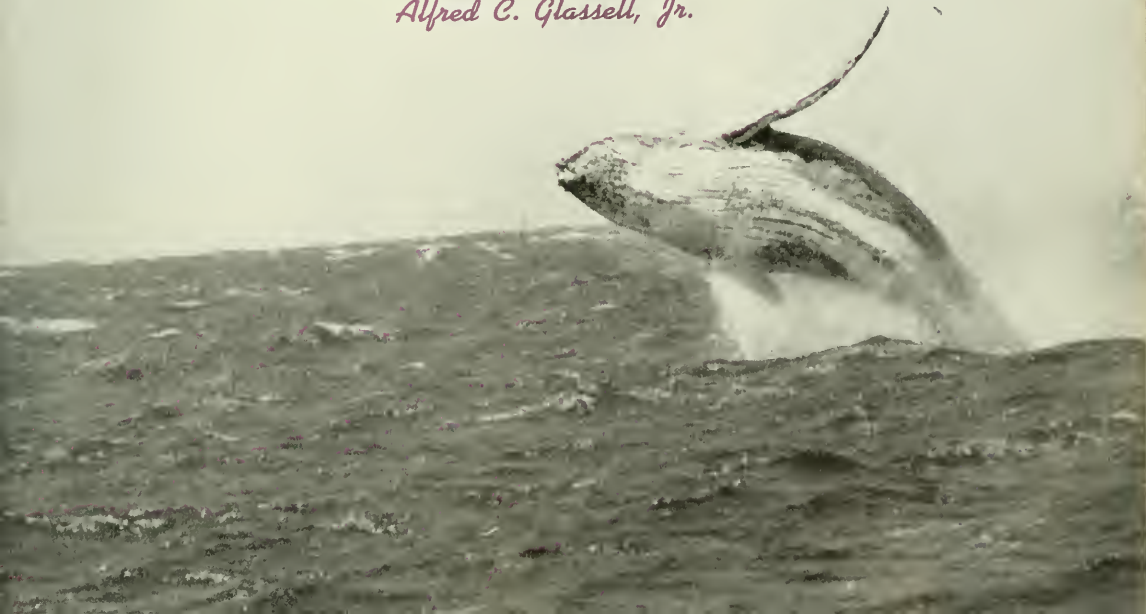
It seems that Enrique and crew were fishing in a motorboat painted white, when suddenly a school of whales appeared in the vicinity,

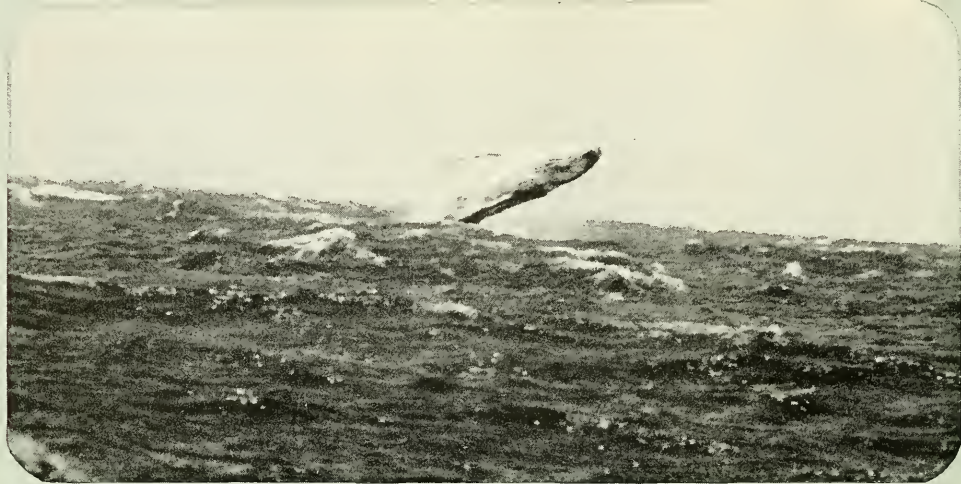
one of which was a large white whale. (Incidentally, there seems to be some confusion in the popular mind about white whales. Albinos have long been recognized as a universal phenomenon among vertebrates, and many white whales in addition to "Moby Dick" have been reported. But it is not to be supposed that there is a special kind of rare whale that is always white.) This large white whale of Enrique's became attracted to the white fishing boat and approached uncomfortably near it. There the animal began a series of interesting actions and gyrations.

▼ AS THE HUGE WHALE hurled its body into the air, the telephoto camera clicked, taking an unprecedented picture. Note the expansion ridges for breathing along its throat and belly

Sea Giant at Play

Alfred C. Glassell, Jr.





WHALES rarely leap like this when a boat is near; hence the need of a 12-inch telephoto lens. In the photograph at right—a most remarkable picture—note the watchful, downward-turned eye. The humpback's "hump" (dorsal fin) is seen near the tail



▲ THE "MISS TEXAS," from which the photographs were taken off Peru

Everyone on board was impressed with its size and believed its intention to be that of mating. Since the fishing boat was considerably smaller than the whale,



the occupants became quite excited and made a frantic effort to escape the attention of this great mammal. The whale, apparently thinking some sort of a game was involved, followed the boat practically to shore. Only when extremely shallow water had been reached did it turn and leave the chase. Enrique told me he would never forget the experience.

Several years ago, when I was

fishing off the shores of northern Chile and was far at sea in a small fishing boat, I hooked into a large broadbill swordfish and was having quite a fight with it when the engine in the boat took that occasion to stall. It was a very critical moment. In an attempt to keep the swordfish away from the boat while we made efforts to repair the engine and get it running once again, I let the broadbill take con-

siderable line. This he did, but he remained near the surface, with the result that my line was very near the top of the water for the entire distance between the boat and the fish. All of a sudden, out of the deep, a pair of humpback whales surfaced very near my boat and proceeded directly toward the path of my line.

I knew at once that if the whales came in contact with my taut linen line, it might immediately snap and my broadbill would be lost.

I had some tense moments as I watched the two whales approach the line and waited for the momentary slack to tell me it had parted. They came to within a fraction of an inch of the line and stopped, blew several spouts of air, and submerged, passing under the line and reappearing on the surface a short distance beyond. They then continued on their way. They had completely cleared the line. We repaired the boat. I saved the fish and have always liked whales.

Whales arouse in me a feeling of protective tenderness. While observing a small school of humpback whales one day in their surface activities, I maneuvered my boat very close to them in an effort to see what they were doing. They appeared to be rolling and generally playing around in a happy manner when all of a sudden, out of the sea, popped a baby whale some twelve to fourteen feet long. Thereupon followed a fascinating action on the part of the

mother whale to protect her young.

We felt sure that this was the mother, protecting and nursing her infant. When, all of a sudden, the young whale was exposed to the surface and to the unknown, there was every indication it meant uncertainty and danger to the mother. With a quick flip of her tail and fins, she sucked the baby whale immediately down to her underside, a safe and protected haven from whatever might be dangerous on the surface.

But to get back to my story, I have observed the surface action of whales on various occasions of this sort, and I had become possessed with the desire to obtain photographic evidence of my observations. This was not an easy task. The pictures would have to be made from a small boat bouncing in a rough sea under varying light conditions. Even though it is possible to approach very close to whales on the surface, it is my experience that only when they are at great distances from a motorboat will they actually display their greatest activity, such as fluking and jumping. When a boat is near, they will only lie on the surface and roll sometimes. So, in addition to the problems we already had, there was the enormous difficulty of taking pictures at a great distance.

After we had done considerable research, we concluded that we

would attempt the work with a 12-inch telephoto lens and a sequence action camera. It took a lot of time to assemble the equipment, and, as any cameraman can appreciate, such "high powered" apparatus required extreme balance in handling during the actual work.

Having built our cameras specially for the job, we proceeded to Talara, Peru, where we made our headquarters and drove 40 miles north each day to a small dock where I kept my cruiser. Right offshore from this spot was the junction of the two great South Pacific currents, the Humboldt and the Equatorial, or, as it is called by oceanographers, the Niño Current. The Humboldt is swinging northward here and runs into the Equatorial Current, which is swinging southward. The joining causes the Humboldt Current to veer to the west.

In this area exists the greatest abundance of sea life I have ever seen. It embraces every type, from the microscopic plankton through all of the small fishes up to the marlins and broadbill swordfish, as well as the giant rays and the great whales. The milling around of the food supply, stirred up by the currents, counter-currents, slicks, boils, and upsurges, makes it possible to see a whale almost any place.

The morning we took these pictures, we noticed a great surface

▼ **FLUKING:** The tail slides into the water with scarcely a ripple. Whales sometimes signal to each other by lobtailing, or hitting the tail on the water



disturbance far in the distance. There was something there we could not recognize, and we wanted to investigate. We gunned our engines and headed in the direction as rapidly as possible. In a short time, we were able to discern a whale on the surface, but he was still too far away to photograph even with our long-range lenses. The great question was—would he continue to be active until we could come within shooting distance?

Luck was with us. In a short time we were able to shoot, and the whale performed the fantastic gymnastics you see here. As we watched this great surface display, spellbound in admiration, we could not help but feel that the whale was enjoying itself. Whalers contend that when the creatures go through these gyrations, they are trying to rid themselves of barnacles. We are assured, however, by Dr. Robert Cushman Murphy, that this is not the only reason why whales jump and that it is likely that our magnificent humpback was simply having himself a good time. Dr. Murphy estimates that this whale was about 45 feet long. The animal certainly seemed to be feeling fine, and he showed no awareness of danger near at hand. He was just jumping around, feeling his oats.

We believed we had the pictures, but so special a photographic job as this always leaves one in considerable doubt, and much time remained before we would actually know. In this isolated spot there were no facilities or materials available for developing and printing the photographs. We had to wait for the long trek back to Houston, Texas, for the final answer.

All travelers and adventurers returning from strange realms try to support their adventures with pictures of what they have seen or experienced. In this case, I believe the photographs represent an experience in themselves. I am informed on good authority that they are probably the only ones of their kind ever procured.

Which are th



Biggest?

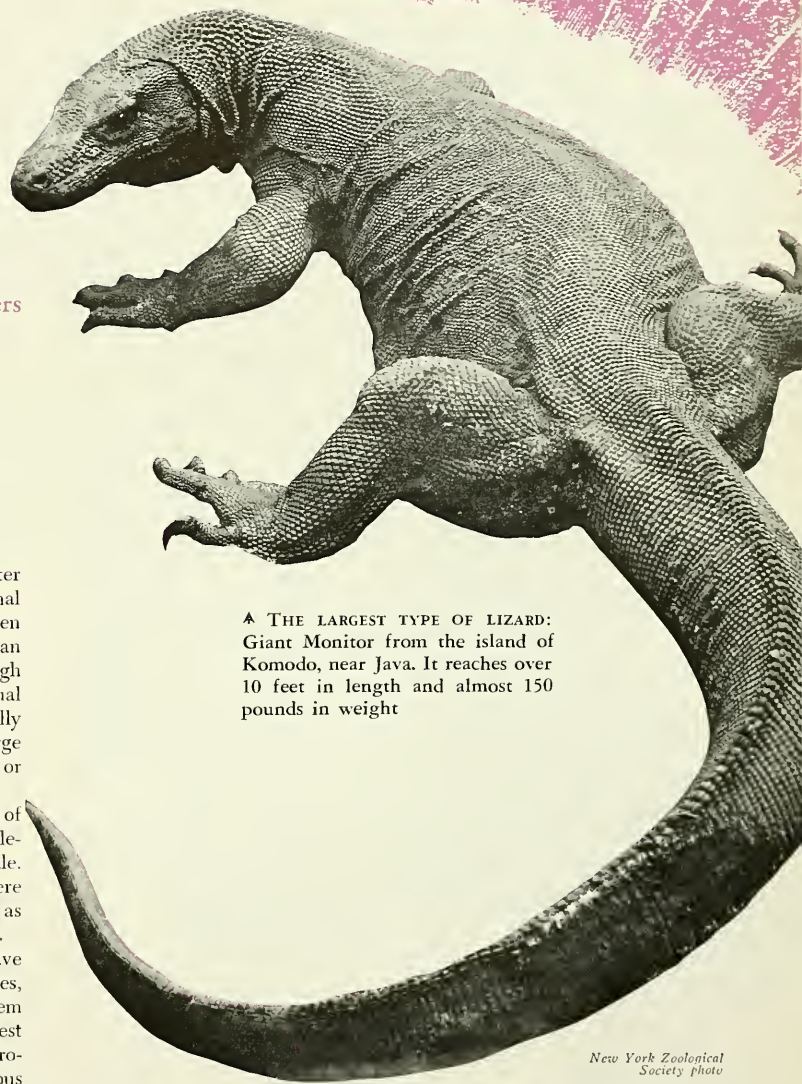
An astonishing parade
of Nature's record-breakers

By OSMOND P. BRELAND
University of Texas

ONE seldom hears a hunter boast of the smallest animal he ever killed; nor do fishermen vie with each other to see who can catch the tiniest fish. Although people are interested in the unusual or exceptional, they are usually more attracted by the very large than by the smallest of objects or achievements.

When one thinks of the giants of today, he usually pictures the elephant or the sulphur-bottom whale. Yet among lesser creatures there are record-holders that are just as spectacular in their own sphere.

Protozoans, for instance, have only a single cell in their bodies, and we would thus not expect them to compare in size with the largest of other groups. Some of the protozoans are responsible for serious human diseases such as malaria, leishmaniasis, and amoebic dysentery. Most of them are so small that they cannot be seen with the unaided eye. On the other hand, there are comparatively mammoth protozoans, and Dr. Theodore Jahn, of the University of California, states that there is a greater



▲ THE LARGEST TYPE OF LIZARD:
Giant Monitor from the island of
Komodo, near Java. It reaches over
10 feet in length and almost 150
pounds in weight

*New York Zoological
Society photo*

range in size among the Protozoa than in any other group of animals.

One of the smallest protozoans is the one causing kala azar, a type of leishmaniasis in human beings. Even husky specimens may be only 1/25,000 of an inch long. The largest of the protozoans belong to a

group that is parasitic on fish. One kind (*Myxobolus*) causes what is known as boil disease in certain European fishes, and individuals may be nearly three inches long—surely a decent size for one cell! Dr. Jahn has estimated that the largest protozoan has approxi-

◀ THE KING COBRA, longest of the poisonous snakes, is known to exceed 18 feet. A view from an exhibit in the American Museum

★
For help in the preparation of this article, the author is indebted to John C. Armstrong, C. M. Bogert, T. Donald Carter, Mont A. Cazier, Eugene W. Gudger, Libbie H. Hyman, Francesca R. La Monte, and Robert Cushman Murphy, all of the Scientific Staff of the American Museum of Natural History.

WHICH ARE THE BIGGEST?



New York Zoological Society photo

▲ IVAN, a magnificent Peninsula Giant Bear (*Ursus gyas*), who stood nearly 9 feet high and weighed about 1200 pounds

mately two quintillion times the volume of the smallest one!

Jellyfish are comparatively simple creatures, and the bodies of many of them are composed of more than 96 per cent water. But any swimmer who has contacted the stinging cells of a large jellyfish knows that they must be regarded with respect. The body of a large jellyfish consists of a rounded mass of jelly-like material, which is sometimes called the bell. Around the margin of the bell there are at-

tached a large number of long strandlike appendages called tentacles. In view of the comparatively simple structure of these jellyfish, it is amazing how large some of them grow. Professor Louis Agassiz, one of the best known of the early American biologists, measured a specimen found off the Massachusetts coast, and its bell was $7\frac{1}{2}$ feet in diameter. Its tentacles were more than 120 feet long! Others with bells twelve feet across have been reported. There is no

animal known, either living or extinct, with appendages or body as long as the tentacles of the largest of the jellyfishes. As we shall see, however, some are almost as long and considerably more bulky.

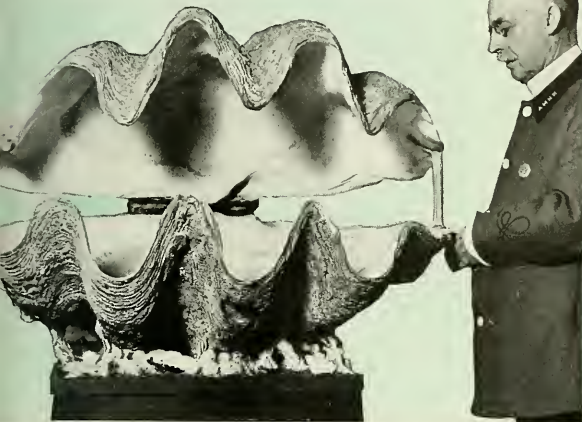
The name "worm" is used for any kind of soft-bodied animal that is very long and slender, and there are a multitude of different sorts, such as earthworms, tapeworms, hairworms, flatworms, and roundworms. There are also many other kinds of worms, including some that live in the ocean, called proboscis worms, or nemertine worms. They are called proboscis worms because they have a long tube or proboscis, that they can project at the front of their bodies. This they extend from time to time to grasp some small creature for food. It is somewhat debatable what kind of worm should be given the title of the world's largest, but the two outstanding competitors seem to be the proboscis worms and the tapeworms.

The proboscis worms have great powers to expand and contract their bodies, and one of the largest measures 80 to 90 feet when fully extended. It is quite possible that there are individuals more than 100 feet long.

Tapeworms, of which there are several kinds, are well-known parasites in the human intestine. People become infected with certain kinds of tapeworms by eating improperly cooked fish, beef, or pork in which infective stages of the parasites are sometimes found. The beef tapeworm and the fish tapeworm are the largest of the tapeworms, and there is some disagreement as to which attains the greatest length. The fish tapeworm gets to be 60 feet long, and the beef tapeworm has been reported to grow to as much as 100 feet. Dr. Asa Chandler of Rice Institute cites a case of a Russian woman who was furnishing a home for six fish tapeworms. When the woman was given medication and the worms passed from her body, they were found to aggregate 290 feet. Under the circumstances, these

► A JAPANESE SPIDER CRAB, in the American Museum of Natural History. Some of these have a spread of 12 feet

▼ THE WORLD'S LARGEST SHELL, a giant clam also on exhibit in the American Museum. The two halves total 579 pounds



AMNH photos

worms should have been large enough to satisfy anyone, even though one or two other kinds might get to be slightly larger.

Giant earthworms should be mentioned in passing, since fishermen especially like to find large healthy individuals when looking for bait. A fisherman's quest would be over if he could find but a single large individual of the Australian variety. These creatures average four feet in length in some areas, and individuals as big as a man's thumb and eleven feet long have been recorded. According to reports, however, the natives do not waste these monster earthworms on fish; they remove the "goo" from the worms' bodies and cook the remainder into a concoction that is supposed to be good to eat.

Shellfish are creatures such as clams, mussels, oysters, and scallops that have a shell about their bodies. The octopus and squid are also included within the shellfish group, although their shells are either greatly reduced in size or are entirely absent. Several of these creatures easily qualify as giants of the animal world. The so-called giant squid, found off the coast of

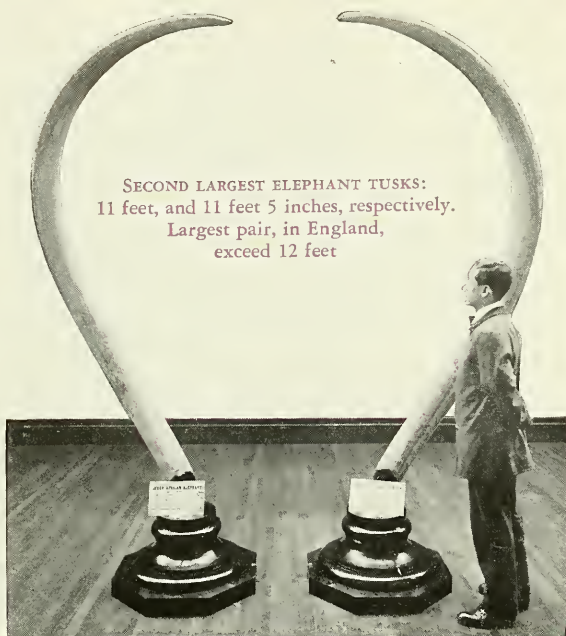
Newfoundland, is the largest of this group. Squids have ten arms or tentacles, two of which are much longer than the others. The largest of these squids actually measured, so far as could be determined, had an over-all length of 55 feet. The body was 20 feet long, while the longest of the tentacles measured 35 feet. It has been stated that pieces of squid tentacles have been found that were two feet in diameter. If this be true, such monster squids must measure 100 feet in length when alive. A large squid would certainly weigh more than a ton, and although certain worms and jellyfish may be longer, the giant squid is considered the bulkiest of the creatures without a backbone. The octopus, a relative of the squid, may also be sizable. One with a tentacle span of 28 feet has been measured, while off the coast of Australia they are reported to attain a diameter of 40 feet.

Most of us have probably eaten clam chowder that was so dilute that we wondered if it had ever seen a clam. Such problems would not arise if cooks had routine access to an occasional individual of the giant clam of the Pacific. One

of these creatures could be used to make clam chowder for an army, while the shells may measure as much as three feet across. The American Museum of Natural History has a pair of the largest shells on public exhibition. Together they weigh 579 pounds.

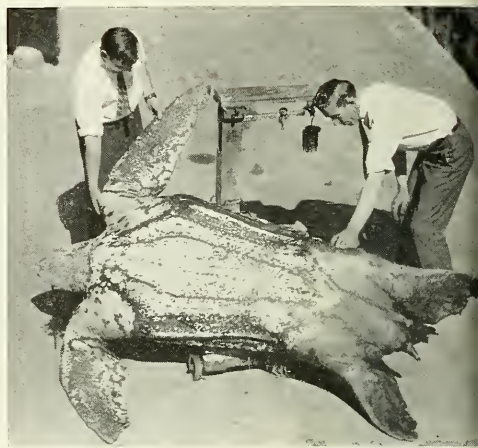
Before leaving the animals that have no backbones, a few other giants should be mentioned. The spider crab of Japan may have a leg-spread of 12 feet, while an American lobster of 34 pounds has been recorded.

Huge spiders that catch birds are known with a leg-spread of over eight inches, and venomous tropical centipedes nearly a foot in length have been reported. Insects must also come in for their share of attention. The longest insect hails from Borneo and belongs to the group known as walking sticks. One of the largest actually measured was thirteen inches long. One would be tempted to use a shotgun in hunting some of the Australian moths. The Hercules or Atlas moth may have a wingspread of twelve to fourteen inches. Some large beetles, related to the June bugs and May beetles of the United States, are probably the



SECOND LARGEST ELEPHANT TUSKS:
11 feet, and 11 feet 5 inches, respectively.
Largest pair, in England,
exceed 12 feet

N.Y. Zoological Society photo



AMNH photo

▲ THE LEATHERBACK outgrows all other turtles. This giant from Long Island, N.Y., bowed to Canadian champion weighing 1450 pounds

bulkiest of the insects. Competitors include the Goliath beetle of Africa and the Hercules beetle of South America. These creatures may have an over-all length of more than six inches with a husky body to go with it. Some of these monster beetles fly with such power that one has been known to break an electric light bulb when it bumped into it by accident.

Large fish are of interest to everyone, especially to fishermen who take great pride in the size of their catch. Unfortunately, the largest of the fish will probably never be caught on a hook. This fish is a kind of shark called the whale shark because of its large size. One of these fish 45 feet long has been measured, and another was estimated to weigh over 26,000 pounds. This fish is comparatively rare and only a few large individuals have been captured, but competent authorities have estimated that the largest individuals may reach 60 feet or more in length. The food that this shark eats is one reason fishermen are not likely to catch one of these monsters on a hook. Despite their large size, they feed upon some of the

tinest creatures in the ocean, such as small fishes and squids. The chances are that they would not be attracted by large hunks of meat that are sometimes used as bait for other sharks. The whale shark could not eat a man even if it wanted to. The teeth are less than a half inch long, and the throat is quite small.

Other large fish and their reported sizes include the basking shark, which may measure some 30 feet and weigh nearly 10,000 pounds, and the sawfish, so-called because it has a snout with sawlike teeth along the edge. The well-known English biologist, Dr. J. Arthur Thompson, published a photograph of a sawfish in *The New Natural History* which he stated was 29 feet long and weighed 4500 pounds. Other authorities state that 20-foot sawfish are not uncommon. The manta rays, also called devilfish, are related to the better-known sting rays or stingarees. They have a flattened body that is actually wider than it is long. One specimen caught off the coast of Florida some years ago had a width of 22 feet. The only scales available at

the time had a capacity of 3000 pounds, and it was found that the manta was much too heavy to be weighed accurately. It is interesting to compare these large fishes with the smallest of their clan. The smallest fish is a kind of goby found in the Philippine Islands. When fully grown it is only slightly more than a quarter of an inch long!

The size of large snakes has probably been exaggerated more than that of any other animal. Many people think that some grow to be 50 to 60 feet long. Most biologists believe that the longest of the snakes is the regal python found in parts of Asia and adjacent regions. There is one authentic record of a 33-foot regal python, and this is the greatest length officially recognized for any serpent. On the other hand, the anaconda, a large water snake of South America, is certainly a competitor, and it might very well be the champ. A short time ago, I received a letter from a man now living in Canada who had done considerable exploring in Brazil many years ago. He stated that in 1924 he had killed an anaconda

that measured 12.93 meters, or approximately 42 feet in length! Unfortunately, this great length has not received official recognition, although anacondas of approximately 25 feet have been recorded. The king cobra, incidentally, is the longest of the poisonous snakes. Specimens of more than eighteen feet have been confirmed. The diamondback rattler, a more bulky snake, has a maximum length of between seven and eight feet. There is an old record of eight feet nine inches, but this was probably based on a skin, as the anaconda record mentioned above may have been.

Anyone interested in the size of crocodiles will certainly have seen old measurements of as much as 30 feet reported. Large crocodiles were certainly more common many years ago, but even optimistic biologists do not believe that they grew to be 30 feet long even in the heyday of their existence. According to Dr. Karl Schmidt of the Chicago Natural History Museum, the longest verified record for a crocodile is 22 feet, 4 inches. This specimen was killed some years ago in South America. The largest of

the turtle clan is the leatherback or trunkback turtle, which lives in the ocean. One of these reptiles caught off the Canadian coast weighed 1450 pounds and had a front flipper spread of more than 8 feet.

Everyone agrees that the ostrich is the largest living bird. A full-grown male may be 8 feet tall and weigh more than 300 pounds. But authorities are not as much in agreement as to which bird has the greatest wingspread. The two chief competitors are the South American condor and a sea bird, the wandering albatross. The wingspread of both these birds has certainly been exaggerated, and a late edition of a well-known encyclopedia even states that the albatross may have a wingspread of seventeen to eighteen feet. The greatest verified wingspread for the albatross is eleven feet, four inches, and this is the largest of several hundred birds measured by different men. The largest condor that I can vouch for as having actually been measured had a wingspread of slightly more than ten feet.

The sulphur-bottom or blue whale is the largest of the mammals. In fact, so far as is known,

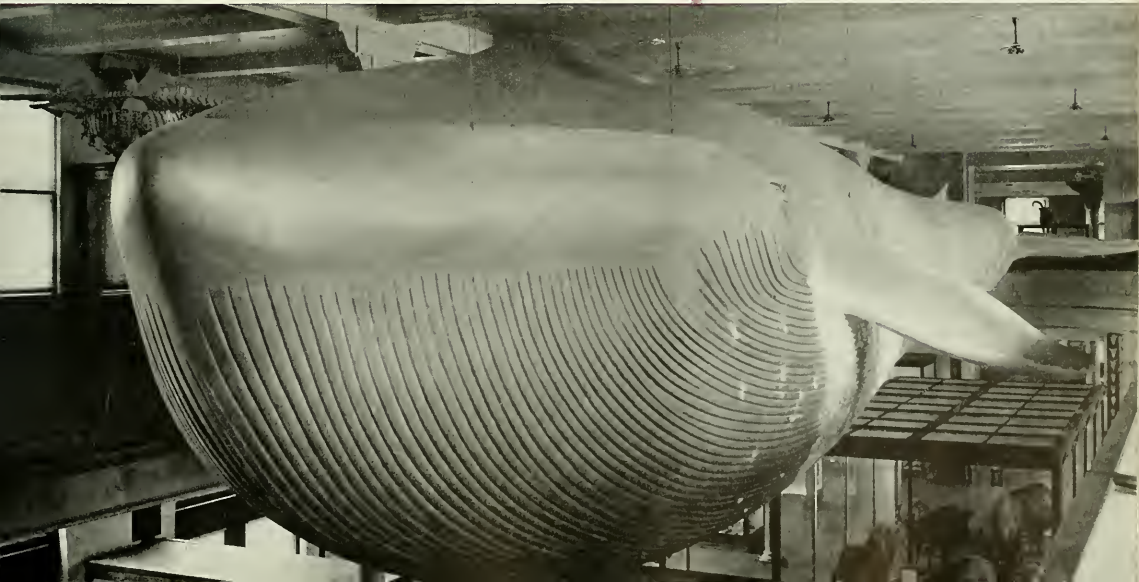
this creature is the largest animal that ever lived. Several whales of more than 100 feet long are on record, while large specimens may weigh more than 300,000 pounds. An 89-foot whale, weighed aboard ship, piece by piece, was recently found to weigh approximately 300,707 pounds.

Elephants, well known to circus goers and favorites with children of all ages, are the largest of land-dwelling mammals. There are two different kinds of elephants, the African and the Asiatic. Asiatic elephants are most often seen in circuses, but the African variety attains the largest size. Certainly the most famous elephant ever exhibited was Jumbo, an African elephant that toured the country with a circus many years ago. Surprisingly, scientists were never able to get exact measurements of Jumbo before his death. According to one report, the late Dr. William T. Hornaday, former director of the New York Zoological Park, once requested permission to measure Jumbo. His request was turned down flatly by one of the outraged owners of the circus. However, we can be fairly sure the elephant stood about eleven and a half feet at the shoulder. Several wild African elephants over eleven feet have been killed, and at least two

Continued on page 96

AMNH photo

▼ A FAVORITE of visitors to the American Museum, this sulphur-bottom whale typifies the world's largest creatures. Some exceed 100 feet



the Educated Elephants of Thailand

The diamond among woods

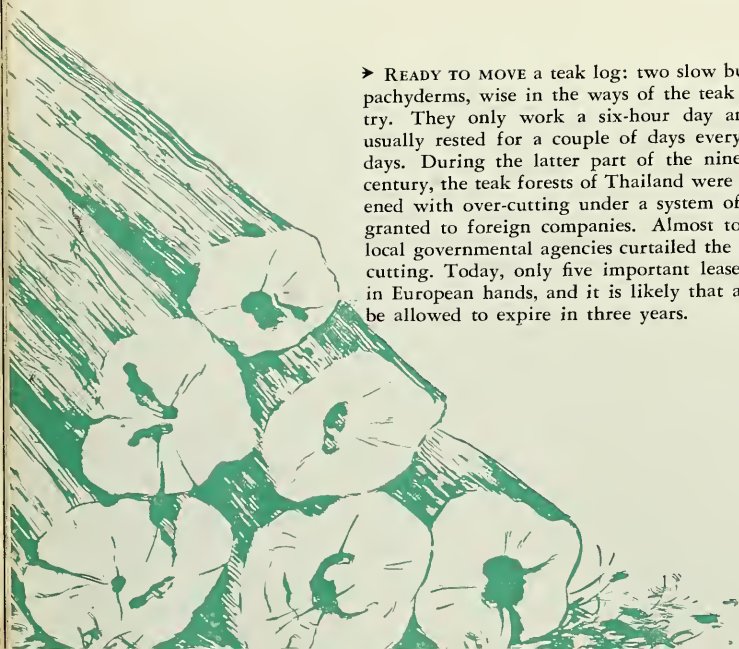
is harvested by the academician among animals

A photo series

by HELEN FISCHER

from Three Lions

➤ **READY TO MOVE** a teak log: two slow but sure pachyderms, wise in the ways of the teak industry. They only work a six-hour day and are usually rested for a couple of days every three days. During the latter part of the nineteenth century, the teak forests of Thailand were threatened with over-cutting under a system of leases granted to foreign companies. Almost too late, local governmental agencies curtailed the rate of cutting. Today, only five important leases exist in European hands, and it is likely that all will be allowed to expire in three years.

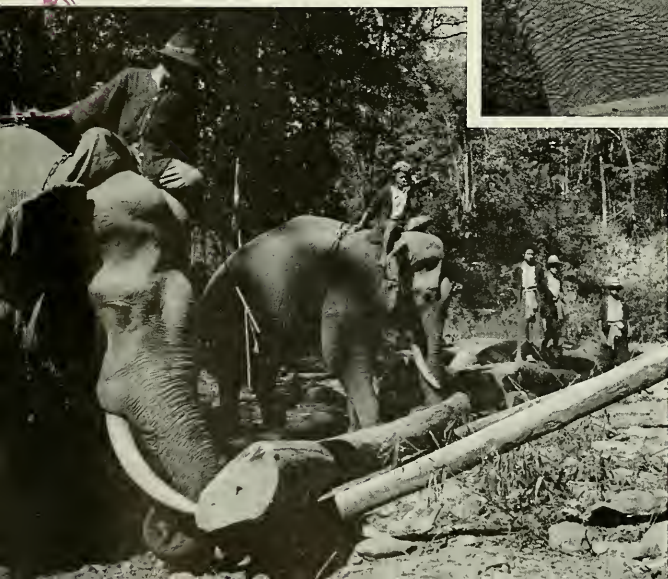






▲ A NATIVE marking a teak log with the owner's property-sign. This practice saves logs from loss and theft. Lately, however, many logs (averaging \$150 in value each) have been stolen. The mark is removed by the thieves and the logs are smuggled to market by way of small canals

(Below) TWO ELEPHANTS LINE UP, one on each end of the log. With the mahout to guide their movements, they will nudge it up the inclined plane with their trunks



➤ HUGE CHAINS attached to the elephant's body and fixed to the log enable the animal to drag it to water or trucks. At least two years before felling, the trees are girdled and allowed to dry out so the wood will float. One peculiarity of the teak tree (*Tectona grandis*) is that its twigs are quadrangular and contain large quadrangular pith. The oily, durable wood of the teak tree is outstanding for its low shrinkage with changes in moisture content



(Above) THE MAHOUT must have a good sense of balance to keep from being thrown off by the sudden movements of the elephant

(Right) HEAVE HO! Up and onto the waiting truck, the elephant maneuvers the heavy log as easily as we would a piece of kindling







◀ THE VALUE of a trained elephant has risen greatly in recent years, because the price of teak has increased 30% over what it was in 1939. The Department of Forestry of the Thai Government supervises some 48,500 square miles of teak forest. About half of this is under exploitation for a 15-year period, while the other half is reserved for reforestation purposes. Post-war logging has not yet returned to normal. Before the war, about 1,820,000 cubic feet of teak came down the Chao Phya River to Bangkok each year. In addition, considerable quantities were exported through Indo-China and Burma

➤ AFTER WORK, the elephants wade and splash in a cool stream, obviously enjoying themselves



▼ REFRESHED BY his bath, the trained elephant happily climbs the shore. He will soon be enjoying a hearty meal and a period of rest. Since the elephants do not breed readily in captivity, new recruits are necessarily secured from the wild herds. Though

younger animals are preferred, even the older ones learn readily when taught properly. Thus some of the last surviving relatives of the mammoths of the Ice Age make themselves useful to man in the tropical forests of southeast Asia, even in the machine age



➤ OGAC LAKE (at right), home of the fish, flows out into Ney Harbour (at left) through the outlet in the center of the picture. Just below the outlet can be seen the two white tents of the McCall-Dawson Expedition of 1952

McCall-Dawson Expedition photo



▲ DR. MAX DUNBAR, Associate Professor at McGill University, who led the first scientific expedition to study the cod in Ogac Lake, in 1951. He is the head of the Eastern Arctic Fisheries Investigation

➤ ONE of the cannibal codfish caught on rod and line in Ogac Lake

McCall-Dawson Expedition photo





◀ RESEARCH SHIP "CALANUS," floating laboratory of the Fisheries Research Board of Canada, in Frobisher Bay. This 50-foot vessel, specially built in 1949 for Arctic research, took both expeditions to the lake of the landlocked cod

Dr. Max Dunbar photo

in Arctic Lake

Eskimo rumors lead to the discovery of large landlocked fish with voracious appetites—possibly survivors from an earlier climatic cycle

By CLYDE KENNEDY

AN STRANGE Arctic lake that contains rabidly cannibalistic Atlantic codfish has been found and investigated by Canadian expeditions. The codfish, which attain a length as great as four feet, seven and a half inches, may have been isolated in the tiny, partly-fresh, partly-salt lake between 1000 and 4000 years ago.

Dr. Max Dunbar, Associate Professor in McGill University's Department of Zoology and head of the Eastern Arctic Fisheries Investigation, heard rumor of the lake from Eskimos back in 1939. The Eskimos claimed they occasionally stopped at a small lake on the 1000-mile-long island to catch *ogac* (cod). From them, Dr. Dunbar located the lake fairly closely and planned to visit it at the first opportunity. But service as Canadian consul in Greenland during the war years and research

projects in Ungava Bay after the war prevented him from reaching the lake.

In 1951, while directing marine research in Frobisher Bay, his opportunity came to check on the Eskimos' story. The fascinating report of what his expedition and another expedition that visited the lake this summer found has just been released.

The "Calanus," a 50-foot "floating laboratory" built in 1949 for Arctic research, chugged halfway up Frobisher Bay, a 150-mile-long indentation in the southern end of Baffin Island. The vessel then turned into Ney Harbour, a fiord that extends five miles in a westerly direction from the great bay. At the head of the fiord, which lies in the shadows of the rugged Evrett Mountains, the scientists found fresh water cascading down from Ogac Lake. They hauled a

dinghy up the 80 yards to the tiny lake to check at last on the landlocked cod.

They quickly caught codfish and discovered that when they got one on their line, other cod would attack the hooked one, tearing it apart. "If a seal got into Ogac Lake," says Dr. Dunbar, "I believe it would be torn apart by the cod."

When a cod was hauled alongside, zoologist Ian McLaren would catch it by the gills and pull it into the dinghy. He was rudely taken aback on one catch when he found himself putting his arms around a monster cod four feet, two and a half inches in length!

The scientists found the lake roughly L-shaped, the longer arm about one mile in length and the shorter one about two-thirds of a mile. It consists of three basins separated by shallow water. The deepest point found in the lake was 200 feet. The lake is fed by the Ogac River and another small stream, which is unnamed.

In addition to soundings, Dunbar's expedition took temperatures and salinity tests. They found that from the surface down to a depth of fifteen feet the water was fresh. From there to the bottom, the water was salty, having about three-quarters the salinity of Atlantic Ocean water. The water close to the bottom of the lake was found to be stagnant, with a strong odor of hydrogen sulphide. The cod were hooked in the salty region above the stagnant water.

The fresh water entering the lake from the two streams slides over the surface of the lake to cascade over a sill into Ney Harbour. "The volume of fresh water flowing in and out of the lake is quite con-

siderable," says Dr. Dunbar. "The outflow stream is about 30 yards wide on the average and some two to three feet deep in its upper portion."

Dr. Dunbar had felt that salt water might slosh over into Ogac Lake during high spring tides, though his party could not remain in the area long enough to observe such a tide. But he felt certain the cod didn't get into the lake when and if that happened. The reason was simply that there are no cod in the fiord or in Frobisher Bay. The nearest point at which cod are found is in the region of Resolution Island, off the southern tip of Baffin Island and about 100 miles from the fiord.

The question of what happens at spring tides was settled last summer by the McCall-Dawson Expedition, a two-man party financed by the McGill University-Arctic Institute-Carnegie Grant for Arctic Studies. Through a generous grant by the Carnegie Corporation of New York, it has been possible for the University and the Montreal

branch of the Arctic Institute of North America jointly to send younger scientists into the Arctic, enabling them to get experience without having to compete with

mature scientists for the regular Arctic Institute grants.

Storrs McCall, 21, and Arthur Dawson, 20, were flown to Frobisher Bay by the R.C.A.F. and

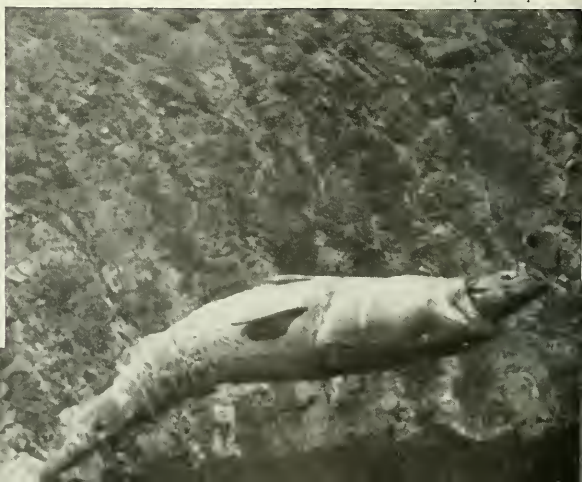


McCall-Dawson Expedition photo

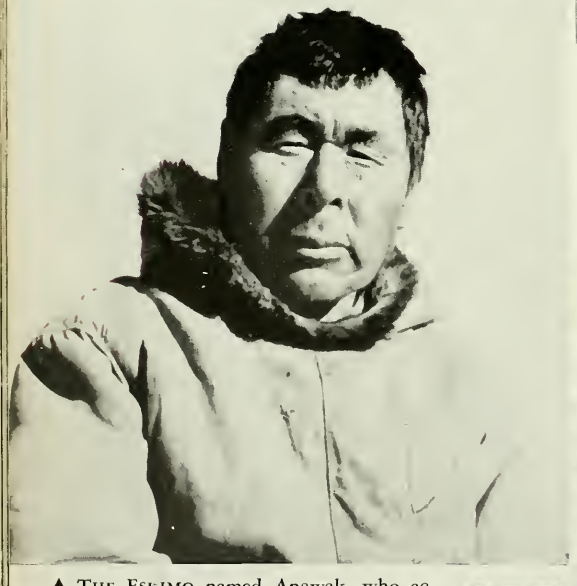
▲ **EXPLORER** with convicted cannibal; Storrs McCall, 21-year-old leader of the McCall-Dawson Expedition of 1952, holding a 4-foot 5-inch cod. The 7½-pound cod lying in the corner of the boat was the unintended bait that brought the big fish to where it could be snagged

▼ **THE SMALLER FISH** had been hooked when the larger one tried to swallow it as shown here. A re-enacted photograph

McCall-Dawson Expedition photo



Dr. Max Dunbar photo



▲ **THE ESKIMO** named Anawak, who accompanied Dr. Max Dunbar's party and caught their longest cod, 4 feet, 2½ inches long



McCall-Dawson Expedition photo



McCall-Dawson Expedition photo

▲ STORRS MCCALL of the McGill University Expedition of 1952 with the longest cannibalistic cod so far caught in Ogac Lake. It measured 4 feet 7½ inches

➤ STORRS MCCALL with portable radio on Knife Edge Mountain, near Ogac Lake, Baffin Island

from there taken to Ney Harbour by the research ship "Calanus" to start further investigation of Ogac Lake in mid-July, while the "Calanus" went on to other research in the bay.

McCall and Dawson witnessed an unusually high tide that lasted for five days, reaching its greatest height August 6. This, they saw, resulted in a considerable flow of water into Ogac Lake from the fiord. The depth of the flow over the sill was about three and a half feet at the deepest spot they measured.

McCall and Dawson saw hundreds of sculpins, about three-quarters of an inch long, being carried into Ogac Lake during the high tide. The hungry cod of Ogac Lake gathered near the outlet of the lake, which of course was now temporarily an inlet, and came right to the surface to catch the sculpins. "The sculpins lasted no longer than a day," says Arthur Dawson.

The young explorers were as impressed as the Dunbar party had

▲ THE MCCALL-DAWSON EXPEDITION CAMPSITE by Ogac Lake



McCall-Dawson Expedition photo

been by the cannibalism of the Ogac Lake cod. They put metal tags on a number of the cod, and although they never recaptured a cod they had tagged, they did catch cod with these metal tags in their stomachs!

And the McCall-Dawson Expedition, in bettering the record of a four-foot, two-and-a-half-inch catch by the Dunbar party, created quite a fish story. McCall caught a seven and a half pound cod with

rod and line and proceeded to haul it in. As usual, other cod attacked the hooked one.

"But this time," says Arthur Dawson, "a big cod locked its jaws on the smaller cod and held on. It didn't let go until McCall had almost pulled its head out of the water. Then it released its hold on the smaller cod, which it had almost swallowed, and dropped back into the lake. But it didn't move away from our rowboat. McCall

therefore kept the small cod in the water on the end of his line, and I got a jig into action. I snagged the big cod near the tail, and we hauled him in. He was four feet, five inches long and weighed 56 pounds."

The McCall-Dawson Expedition caught an even longer cannibal cod, but he was slightly lighter. This one was four feet, seven and a half inches long and weighed 54 pounds.

Dr. Dunbar points out that even if there were cod in Frobisher Bay and Ney Harbour from time to time, they would experience a great temperature shock if they moved into the lake.

"The temperatures in the lake in August," declares Dr. Dunbar, "are comparatively high, ranging from 4.5 to 7.4 degrees centigrade (40° to 45½° Fahrenheit). The water in Ney Harbour, on the other hand, is close to freezing."

How, then, did the cod get into Ogac Lake? First there would have to be cod in Ney Harbour. They could have ranged that far north when the water in Frobisher Bay was warmer than it is at present. It is possible that the climate of this part of the world was warmer during the early days of Viking exploration, and cod may have ranged farther north at that time. Spring tides still spill over into the lake, so the lake is not yet completely isolated from the sea. Putting these two things together, it is possible that the fish became isolated in the lake as recently as 1000 years ago. Or it may have happened farther back.

On the other hand, the cod may have been isolated in the curious lake when the land rose. The land has risen as much as 600 feet in some parts of the Canadian Arctic during the past 10,000 years. Sea shells far inland and a series of

old beach lines attest to this. The land, therefore, may have risen, leaving a shallow part of Ney Harbour in the form of a lake above the level of the fiord.

Dr. Dunbar describes the food supply of the cod as poor, and this would account to some extent for the strong cannibalistic tendencies they showed at the season when they were observed. But if the fish grow to weigh 56 pounds and if they prove to be abundant, there must be more food than has been accounted for. If they preyed upon each other to any great extent, it has been argued, there would be few large ones.

We are informed that landlocked marine codfish are known also from Mogilnoe Lake on Kildin Island in the Barents Sea (*Gadus morhua kildinensis*) and in fresh-water lakes on Bering Island (Bering Sea), on Bolshoy Shantar Island (Okhotsk Sea), and Avachin Lip on the coast of Kamchatka (*Eleginus navaga gracilis* in all three places). The Kildin cod attains about half the length of the Baffin Island cod, and the salinity of Mogilnoe Lake is similar to that of the Baffin Island lake. The Kildin cod are known to spawn in the lake in early spring.

Many of the codfish caught by the two expeditions on Baffin Island were a golden-brown color, which may have resulted from their habit of eating seaweed and sea urchins (*Strongylocentrotus*). They grow to a much larger size than the general run of Labrador cod.

Dr. Dunbar plans to carry out further research on the curious lake and its poorly fed inhabitants. This study may provide interesting evidence of the changes in temperature and the alterations in height of land that have taken place in the Canadian Arctic within the last 10,000 years.



NATURE has produced many surprising modifications in the plant world. They appear in each major group of plants, from the simplest to the most complex—from diplococcus to daisy. Probably it should be admitted that the carnivorous plants, such as Venus's-flytrap, sundew, and pitcher plant, show some of the most unplant-like habits. But for sheer peculiarity in their business of securing food, none of them can rival *Dactylella*, the trap-line fungus.

This peculiar fungus belongs to the group that botanists call the Fungi Imperfecti—an assemblage of fungi whose life histories are imperfectly known but which, for the sake of convenience, are classed together. The trap-line fungus has roughly the appearance of a miniature string of dieting sausages. Each sausage is a single cell. Other strings project out from the joints between the sausages, creating a branched network of filaments. Spaced along these filaments are the traps. Each is shaped like a doughnut with a handle. The doughnut part is composed of three cells, the handle of two cells. Such is the appearance of *Dactylella*.

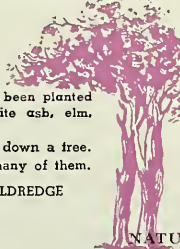
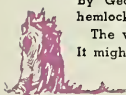
Each one of the cells of the doughnut part of the trap is capable of great inflation and deflation. Under ordinary circumstances, the cells are deflated to the point of

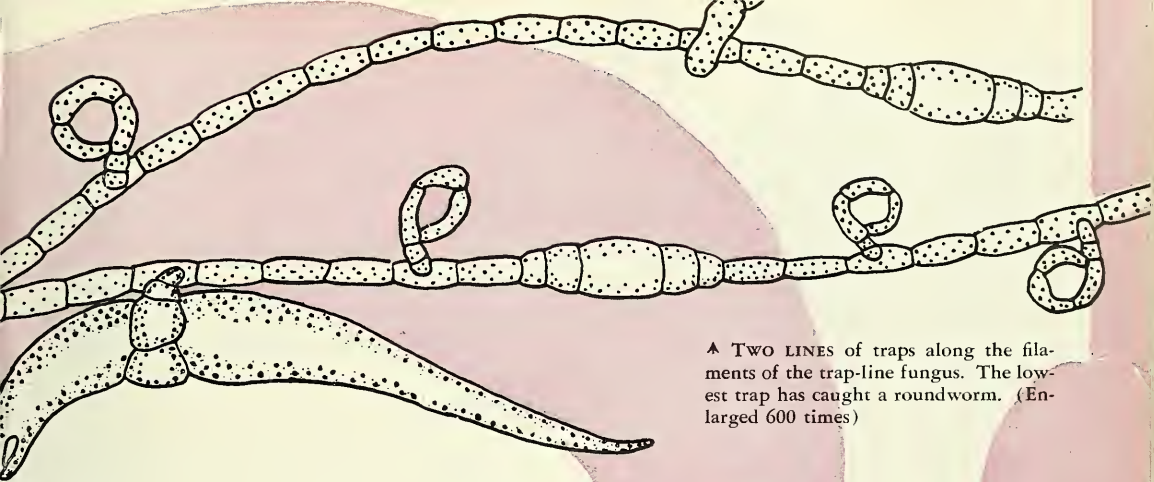
NOT JUST A CHERRY-CHOPPER

Sixteen trees still standing at Mount Vernon are known to have been planted by George Washington, over 150 years ago. They include white ash, elm, hemlock, holly, linden, and various others.

The world knows George Washington as the boy who chopped down a tree. It might well remember him also as a man who planted a great many of them.

JAMES ALDREDGE





▲ TWO LINES of traps along the filaments of the trap-line fungus. The lowest trap has caught a roundworm. (Enlarged 600 times)

The Trap-Line Fungus

It makes a noose and lassos worms underground

By LESTER E. HARRIS, JR.

Drawings by Uriel Thurnheer



▲ WHEN ready to trap a worm, the noose barely maintains its doughnut shape (at left). When a roundworm pokes its front end into the loop, the cells instantly expand to twice their size (at right). Branches grow out from near-by filaments and penetrate the worm. It is digested alive. (Enlarged 1200 times)

barely maintaining their doughnut shape. The trap is thus set, ready for an unsuspecting victim.

Similar traps all up and down the filaments are waiting likewise. A microscopic roundworm, traveling in the neighborhood, pokes its front end into the mass of filaments as though trying to find a way through. It slides into the hole in one of the doughnuts. Instantly the cells expand to twice their normal size, constricting the worm and holding it fast in spite of its efforts to get free. Branches begin to grow out from near-by filaments and penetrate the body of the

worm. Digestive juices are secreted and the worm is unceremoniously eaten alive.

This peculiar mechanism for obtaining food is not always present. Investigators studying the trap-line fungus have revealed that the traps seem usually to appear during a period of food scarcity. Ordinarily, food is ingested from the wet wood or damp woods soil where the fungus lives.

The exact mechanism activating the traps is not known. It is believed that some chemical substance from the worm's body is the trigger that sets the traps in mo-

tion. Mechanical stimulation applied with a fine needle does not cause the cells to constrict.

Reproduction in *Dactylella* is presumed to occur simply by the production of spores which, upon maturity, rest for a while, then germinate to develop into a new network of filaments. The whole story of reproduction is not known.

Nature has an earlier patent for every basic invention produced by man. Here is an example of a simple plant which, in all probability, has been setting out traps long before the steel trap or the snare was ever thought of.



The *Dinkas* of the Sudan

▲ THE WOMEN FEEL for water lily tubers with their feet and gather them in calabash bowls or baskets

Children of the wilderness, they owe their protection from civilization to the hostility of nature

By EDGAR MONSANTO QUEENY
Trustee, The American Museum of Natural History

Photographs by DONALD I. KER

JUST north of the equator and west of the White Nile lies the Sudanese province of Bahr-el-Ghazal. Its expanse is far greater than that of Missouri, and it is inhabited by primitive Nilotic peoples. Lake Nyibor lies in the east-central portion of the province.

White man has made few marks upon this country. In 1950, only 21 whites were stationed there—a few scattered missionaries, the provincial Governor and his staff, District Commissioners and their assistants. It was not until after World War II that the Anglo-Egyptian Condominium, which rules the Sudan, permitted its white officers to bring their wives and families into the Bahr-el-Ghazal, for it is an unfriendly land, torrid and miasmatic, and the tribes are unpredictable and often unruly. Before the advent of air transportation, it was difficult of access,—a three-week steamer journey up the Nile from Khartoum, capital of the Sudan, then an overland trek to interior stations, by motor lorry in dry season but on foot after the rains set in.

Bahr-el-Ghazal's climate is constant in only one respect. It is always hot! Its rainfall, however, averaging 44 inches a year, is concentrated entirely within the six months that the sun is north of the equator, nature's method of tempering its blistering rays. During the rest of the year, rain is almost unknown, and the land be-

comes parched and fissured; grass fires consume the withered vegetation.

The region's lakes and rivers reflect these climatic extremes. The Bahr-el-Jebel, as the White Nile is known there, bounds the province on the east. In March, the dry season's end, it is less than a hundred yards wide; but by September, at the end of the rainy season, it has surged over its papyrus-lined banks to become a great serpentine lake. Inland waters undergo similar transformations. Lake Nyibor inundates 1200 square miles during the peak of the rainy season. By March, however, after a six-month drought, it has been reduced to a mere five square miles of warm, shallow, tawny water, and all lesser waters in the area have vanished.

As Lake Nyibor contracts, the density of life, both in and around it, increases in inverse proportion. Fish that hatched in 1200 square miles of water are crowded into 5 square miles, to attract birds, men, and crocodiles alike. Hippos, too, find Nyibor a haven from the parched countryside. Almost all the life of the surrounding area, aquatic and terrestrial, is concentrated in Nyibor and along its shores,

even the very rare, swamp-loving Nile Lechwe, also known as "Mrs. Gray's Waterbuck."

Nile Lechwes, about the size of white-tailed deer, are beautiful and graceful antelopes. The male's characteristic white shawl drapes over his dark shoulders, and his long horns fit neatly to the curves of his black body when he runs. The female and young are fawn-colored. They have exceedingly large hoofs for support in their swampy haunts. During our visit, a herd of them grazed along the eastern reaches of the lake and at dawn visited its margins to drink. The Nile Lechwe is noted for its shy and retiring disposition, but these individuals were stalked easily to within 100 yards.

Nyibor's bird life in March is rich indeed. Most numerous were the Great White Pelicans—10,000 to 20,000 of them. African Skimmers were there in abundance—graceful little birds flying in groups of 50 or more. They banked and swerved in unison, then flew close above the lake, their strangely elongated lower mandibles extended and occasionally grazing the surface to scoop up tender bits. Marabou Storks were plentiful. With measured military strides

➤ **WET-SEASON HUT.** The thatched roof keeps out the rain yet permits ventilation. Note how tall and thin the man is



▼ **DINKA MAN AND WIFE:** both wear ornaments but no clothing. They travel light. The tribe concentrates around Lake Nyibor in the dry months and spreads out for the wet season



they waded along the margins of the lake to mingle with rafts of White-faced Tree Ducks, Spur-winged Geese, Sacred Ibis (the emblem of ancient Egypt), Saddle-billed Storks, and diminutive Spur-winged Plovers dressed in feathery tuxedos. Fetching little Lily-trotters nodded from almost every lotus, while the air was filled with the delightful music of Fish Eagles and the haunting cries of exotic Sudanese Crowned Cranes. The latter reminded us, even under a torrid sun, of dark and cold American dawns when Canada geese are on the wing.

At the lower end of the sound scale was the persistent roaring and snorting of hippos. A school of nearly one hundred spent the daylight hours in the lake's center, and we wondered how four-ton bulls could submerge themselves in its mere five feet of water. At night they waddled ashore, each to find his hundreds of pounds of withered grass and to grunt and roar, often much too close to our tents.

The great spectacle of Nyibor, however, was its people—the Dinkas. These happy Nilotics live exactly as their ancestors must have lived through many past centuries. Dinkas have no laundry problem.

Only married women are clothed; they are distinguished by goatskin lappets, or aprons. Men and unmarried girls wear nothing but girdles of beads. However, beads are not their only form of ornamentation. Both sexes and all ages smear themselves with dung ash streaked into patterns. The ash also protects them from Nyibor's myriads of mosquitoes and flies. Most Dinkas have decorative skin scars on face and body, unique designs slashed into their flesh. Some individuals' hair was bleached to a straw-yellow by constant application of cow urine. Others' heads were smoothly shaved except for coxcombs or circular topknots, in which feathers were fixed Indian fashion.

Dinkas are proud, bappy savages, deigning white men as possible equals, no more. Greetings to us were friendly and gracious; their manner was never sullen or menial as is often the case with more sophisticated African tribes to the south and north.

Dinka wealth is measured solely in cattle and goats and in wives, for, like all African tribes, they are polygamous. In the Dinka scheme, women are property, as horses are in ours. Love, in our sense, seems unknown to them. In our scheme, one may have special affection for particular horses, but he expects of

them utility also. So it is with Dinkas and their women. The women fetch water, cook, build huts, harvest millet, and bear children. They are inherited, along with other property. Ten to thirty head of cattle is the price of a Dinka girl. The father of a very desirable one, because of her physique, manner, or a good family-breeding history, may demand the highest price.

In addition to cattle-owners, each clan has a fisherman section and a blacksmith section. A fisherman might pay a dugout canoe for a bride; a blacksmith, an iron cowbell. A social climber may try to relinquish his lowly status of fisherman or smith and join the ranks of those who possess cattle. For enterprise is rewarded in the Dinka scheme also.

The bride, if bought with cattle, is usually paid for in installments. This often leads to argument and fighting. It also leads to adultery. A younger son must wait until his senior has married, and the senior's marriage may exhaust his family's surplus cattle. If the younger man then fancies a wench, he may be unable to contain himself. Hence, there is often considerable ill-feeling between the elderly rich cattle-owners enjoying their Indian sum-

mers and lusty young braves who see prize belles in the households of sybarites.

Dinkas revere their cattle. With long, curved, tapering horns, like the cattle in old Egyptian friezes, they ornament the pastures as they serve their owners with milk, a chief element in Dinka diet. Dinkas put their urine to many uses, and their dung serves as fuel. Even the dung ash is used in ornamentation and as a source of salt.

Some favored cattle—the song-bulls—have their horns artificially bent, in the ancient Egyptian manner. Just as Mexicans serenade their *señoritas*, Dinka youths sing to these bulls, with verses extolling the bulls' virtues. Except in an extremity such as famine, cattle are seldom slaughtered. But during the rainy season, when fish are not caught easily, a special occasion, such as the meeting of relations to discuss a marriage, justifies slaughtering a bull. Dinkas are loathe to sell cattle, as money has no value to them. They have not learned to desire the things money could purchase. Nature alone supplies their wants, which, incidentally, never extend beyond the present.

▼ **FISHING NEAR HIPPOS.** The man in the stern propels the boat. The one in the bow throws a harpoon that can be retrieved with a rope. Fatal accidents from hippos are frequent





▲ PELICANS OF LAKE NYIBOR. Wildlife of various sorts is abundant around Lake Nyibor in the dry season, when the creatures throng to its shrinking waters for food and drink



▲ FISHES are caught with long spears. One "armor-plated" type is a relic from earlier times, but its flesh was found to be as tasty as that of its modern cousins

During rainy seasons, the Dinkas live in widely scattered communities. Their rainy-season huts are built on stilts, the floors being some six feet above ground, which protects them from both dampness and predators. Cattle graze on surrounding lush pastures. However, during the dry season, when local waters evaporate and pastures parch, the Dinkas follow the receding water. Some clans migrate to the White Nile. Two clans migrate to Lake Nyibor. Even there, pasture land is limited and is the subject of disputes and fights. Recently, 38 members of the Afak Atwot Clan, which occupied Nyibor's southern shore, were speared to death by members of the Cie Clan of the north shore. Four Cies also perished. Before launching the attack, the Cies sacrificed a goat for "good medicine." The score assures them that it was effective.

Not only does Nyibor furnish Dinkas with water and pasture, but its fishes supply them with valuable protein food. Daily, hundreds



of men wade from one end of the lake to the other, pausing every few steps to throw their spears ahead, hoping to pierce fish. Frequently they sing in chorus while moving forward. Some Nyibor fish resemble catfish; others look as though they originated in the Paleozoic. One four-foot species has microscopic eyes and a continuous fin running the length of its back to end in a sharp point, its only tail. Another has red fins and tail and a flat head with beady eyes on

A motion picture depicting the life of the Dinkas, filmed at the time of these observations, will be released by the American Museum under the title "Pagan Sudan."

top. Strangest of all Nyibor's finny inhabitants was the yard-long living fossil fish—*Polypterus*—slender hanger-on from an early prehistoric age. This fish is encased by a heavy armature of diamond-shaped bony scales fitted together by peg-and-socket joints. The most tasty were Tilapias, which, although larger, resembled our crappie; their meat was white, firm, and delicious.

The boldest Dinkas fished from dugouts. Each of these frail sixteen-foot craft, fashioned from the trunk of a single tree, was poled by a man standing in the stern, while his partner, standing in the bow, threw a harpoon, which was retrieved with an attached cord. These dugouts were worked right into the center of the hippo school, where fishing seemed to be best.

▲ THE DINKAS watched their strange visitors bemusedly

► DINKA DRY-SEASON VILLAGE: scattered huts on a parched and glaring plain

It is probable that fish congregated there to feed on hippo dung. Harpoons sailed over hippos, under them and alongside them. More than one harpoon bounced off a resilient hippo, who would raise himself, focus his piggish eyes intently on the interlopers, and open his giant white-tusked maw in protest. Nevertheless, at the day's end each dugout had at least 50 pounds of fish aboard.

Sometimes such audacity begot awful penalties. During the ten days we camped at Nyibor, two Dinkas were bitten by irate hippos

and died later; two others died from encounters with crocodiles. The casualties of a season must be considerable. Curiously, Dinkas regard such happenings as comic. While discussing them, they were convulsed with mirth, just as we might laugh at someone's awkward tumble. Certainly the accidents proved no deterrent to their activities. Immediately after our party had brought ashore a man whose right leg hung by two tendons, a hippo having bitten through his thigh, fishing was carried on as usual! Our morphine and first aid proved of no avail to the victim; he succumbed the following day.

Dinka women are no less bold. In parts of the lake unfrequented by fishermen but inhabited by crocodiles, they collect water lily tubers. With reed baskets or half-calabashes perched on their heads, they searched the bottom with their

feet to locate the plants, then performed neat feats of balancing as they stooped and pulled up the tubers. While we were there, a crocodile bit a girl fatally.

In this dangerous quest for food, Dinkas pass the dry season among Nyibor's birds, sharing their food and their hazards. And as sundown suffuses its warm tones around the lengthening gray shadows, men and women make for shore and their huts. Without being cleaned, the fish are roasted with lily tubers and seeds; the excess fish are split and hung to be dried by the morrow's sun. With their cattle and goats, youths return from the pastures to the kraals.

Then dusk ushers in the sounds of Nyibor's night. Drums beat while young and old dance and drink *mirissa*—their pink, frothy millet beer. Boys chant to their song-bulls. Later on, after the

drums are silenced, the murmurs of the shore's lesser life and the lowing of cattle are interrupted by hippos snorting at dung fires, while in the distance a hyena's sinister cacophony often alternates with the voluminous roar of the King of Beasts roaming and hunting in his own wild kingdom.

Nyibor has heard these sounds and witnessed this dry-season routine for centuries. Probably the same routine will continue unchanged for a long, long time. Nyibor is remote; access is difficult; its climate is most inhospitable; virulent diseases prevail. Furthermore, there is no known resource to warrant the intrusion of white men. In the Bahr-el-Ghazal, Nature, by her very cruelty, has well protected the Dinkas from our atomic civilization and preserved for them their own carefree and primal way of life.



ly of English, Scotch, and Scotch-Irish strains, with perhaps some Pennsylvania Dutch. The chances are that intermarriage among these stocks had been going on in the frontier meltingpot, and Lincoln's ancestry may have included most, if not all, of them.

Although tall stature is typical of these people, Lincoln's height was wholly exceptional. Old Americans in Hrdlicka's sample average about 5 feet 8½ inches. Lincoln was about 7½ inches taller than this average. Stature like his occurs about once in a thousand in Hrdlicka's sample. In Lincoln's day, before the general average had increased as it has over the last century his height was probably even more unusual.

Perhaps the explanation lies in the chance sorting of genes that produced Lincoln and in nothing more. On the other hand, it may not be without significance that Lincoln was born in the United States and particularly in Kentucky. The stocks that formed the ancestry of Lincoln have shown a marked increase in size in the United States compared by successive generations or compared with their sources in the Old World. But in particular Kentucky, along with other Appalachian Mountain regions, was characterized during frontier times by stature taller than the national average. In the small Kentucky community in which Lincoln was born, stature fully equivalent to his was not uncommon. Abraham Enloe was 6 feet 3 inches, and the Brownfield men were said to be as tall or taller than Lincoln.

Even as late as the Civil War, the tallest men in the country came from Kentucky and Tennessee. Perhaps what Lincoln represents in his body development is a genetic make-up (apparently inherited from his mother) that was particularly responsive to the special environment in which he was born. Others of that same stock seem to have been similarly sensitive. Surely, tall, lanky men are common enough in Kentucky and elsewhere in the Appalachian region for a distinct local type to become crystallized or even caricatured in the public mind. Although the stereotype tends to become too rigid and unrealistic, it does reflect some basis of reality. It was Lincoln's resemblance to this Appalachian Mountain type that struck me in the beginning. This was the reason he seemed so peculiarly American, despite his uncommonness. It was like suddenly remembering a familiar name after a struggle to recall it.

Herndon, again, proved invaluable. Writing in 1887 to Bartlett, who apparently had inquired about Lincoln's physical peculiarities, he said: "You ask me if I ever saw in this great Old West many men of Lincoln's *type*, and to which I answer, *yes*. The first settlers of central and southern Illinois were men of that type. They came from the limestone regions of Virginia, Kentucky, Tennessee, etc., and were men of great strength, physically fine and by nature were mentally strong. They were originals, were individualists. . . . No one was like Lincoln, and yet many were of his type. I cannot now further explain than to say that conditions made this class of men . . . may explain to you sometime. Limestone water, so scientists say, gave us big frames. . . ." It is clear, whatever the correctness of his theory, that Herndon was referring not only to character but to physique, and since he was one of the same migration as Lincoln and knew these southern mountain men personally, he was making a first-

hand observation. In his recent book on Lincoln, James Garfield Randall also calls attention to the resemblance in physical type between Clay, Jackson, and Lincoln, all from the same general region and from the same frontier stock.

No American, I suppose, can look at the face of Lincoln with a completely fresh eye. These features have been with us all from our earliest recollections. We have seen them in public monuments, in our first history books, on the walls of our school rooms paired with the portrait of Washington, on coins and stamps. Each February 12 they reappear in newspapers and magazines. And at any time throughout the year we are likely to see that familiar face in countless places and on innumerable documents. In looking at these representations of Lincoln, we remember what we have read of his life, his humanity, his humor, and his suffering. His deeply moving letter to Mrs. Bixby, and the humility of his words spoken at Gettysburg are all part of the overtones that affect us as we look upon that face.

Perhaps for these reasons, these features that Donn Piatt, when he first saw them, called "the homeliest . . . I ever saw" have undergone a metamorphosis. But I suspect it is because we see Lincoln stripped of the troublesome and inconsequential detail—the wrinkled ill-fitting clothes, the tousled hair, the awkward gesture, the immediacy—that we can see him as his more sensitive contemporaries like Herndon could. "He was odd, angular, homely, but when those little gray eyes and face were lighted up by the inward soul on fires of emotion, defending the liberty of man or proclaiming the truths of the Declaration of Independence, or defending justice and the eternal right, then it was that all those apparently ugly or homely features sprang into organs of beauty." And Herndon adds, "Sometimes it did appear to me that Lincoln was just fresh from the presence and hands of his Creator."

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▲ MONUMENT ROCKS are not far from east-west arteries through Kansas, but the motorist is advised to follow directions carefully

The Kansas Pyramids

These monuments of chalk remind the traveler that a sea once covered this part of the United States, complete with strange fishes and swimming reptiles

By B. L. BUSCH

EVEN before Egyptian slaves laboriously piled one stone on another to build pyramid tombs, water and wind were carving a section of what is now west-central Kansas into impressive assemblage of natural pyramids—including a “sphinx.”

Many millions of years ago in the Cretaceous period, this part of Kansas was covered by a great sea that reached from the Gulf of Mexico to Canada. Most of the deposits laid down elsewhere in the bottom of this sea were shale and lime-

stone, but chalk was left in what is now Kansas as well as in South Dakota.

Over the slowly passing years, after the sea receded, the Smoky Hill River cut through the Great Plains country and gradually exposed these grotesque, eroded chalk formations. In three adjacent Kansas counties (Logan, Gove, and Trego), the Smoky Hill and its tributary Hackberry Creek have also bared the nation's most productive beds for fossil fishes and marine reptiles of the period.

Spectacular “Monument Rocks” in Gove County are reached by turning off main east-west U. S. Highway 40 at Oakley. You turn south on U. S. 83 and travel for about 20 miles, then follow signs for Monument Rocks on a short series of secondary roads. Better ask your way from time to time to avoid getting lost.

At the north end of Monument Rocks, the chalk pile known as the “Kansas Sphinx” looks amazingly like the head of its Egyptian counterpart, the Great Sphinx of Gizeh.



▲ Yvette Dugay, replete with carefully manicured nails, plays the part of Minnehaha



▲ Many readers will wish the producers had let them see Indians acting their own parts in this film



▲ Allied Artists' interpretation of an Indian war party

▼ Hiawatha, played by Vincent Edwards receives three arrows of peace from Minnehaha's father



The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

CERTAIN it is that "Hiawatha" (Allied Artists) is no outstanding movie, artistically, dramatically, or scientifically. But since it is not wholly without merit, and because it will be viewed (and enjoyed) by countless children, it deserves more than passing mention.

The producers of "Hiawatha" would have us believe that their film is based upon Longfellow's poem. Other than the wooing and wedding of Minnehaha, and the presence in the cast of certain characters, notably Nakomis (a stately dowager who speaks with a proper Bostonian accent), all resemblances to Henry Wadsworth's epic are entirely coincidental.

The original and historical Hiawatha appears to have been an Iroquois Indian of the Mohawk tribe who thrived about 1570. With commendable zeal he at-

tempted to bring about reforms designed to end intertribal warfare, murder, and strife, and to promote universal peace and well-being.

During the early nineteenth century, pioneer anthropologist Henry Rowe Schoolcraft confused and combined Iroquois tales about the deeds of Hiawatha with similar legends of the Ojibway concerning the exploits of a demi-god, Manabozho. Longfellow later embroidered this original misrepresentation with poetic flights of fancy, omitting almost entirely the political and diplomatic activities of Hiawatha. In the poem, in fact, it is the Great Spirit who urges the warring tribes:

"All your strength is in your union,
All your danger is in discord;
Therefore be at peace henceforward,
And as brothers live together."

In the movie these sentiments are attributed to Hiawatha, and the plot, unlike Longfellow's poem, deals largely with Hiawatha's attempts to make and to preserve the peace.

The film version eschews the career of youthful Hiawatha. When we first see him, he is a muscle-bound youth who, to judge from his biceps, has just completed an intensive course with Charles Atlas. In fact, there is not a member of the cast who even faintly resembles an Indian, and all are painted a ghastly terracotta that runs in the close-ups.

The producers have made certain superficial concessions to ethnographical fact in portraying the life of a Woodland tribe. Thus, the Ojibway (for such, it appears, is Hiawatha's nationality) live in birch bark wigwams instead of in

igloos or pueblos, and the costumes in most scenes are reasonably accurate. On the other hand, inaccuracies in detail are legion and ludicrous. The Ojibway chiefs occasionally wear tremendous feather war bonnets of Plains design. Perhaps some censorship bureau should ban the use of war bonnets in all films not dealing specifically with Plains Indians, and even in these such elaborate headgear should be used sparingly, like garlic. Throughout the movie the Ojibway sets are decked with enough Southwestern basketry and pottery to fill a small museum, and native woodcraft, as depicted in this epic, would outrage a cub scout. The all-time low, however, is reached in one scene showing Minnehaha languidly scrubbing her buckskin laundry on a Mexican corn-grinding stone, her carefully manicured nails belying even the most fleeting contacts with domesticity.

On the credit side, Hiawatha is almost unique in making the point that there were good Indians as well as bad Indians, wise Indians as well as stupid Indians, and this radical departure from the stereotype, at least, represents progress. In short:

We quibble not at twisted history
For the twisters have been many—
Most everyone has had a hand in,
From Schoolcraft to the merest stand-in.

Odds are that in far Ponemah,
(A happy hunting ground reserved for
Native redskin, son and daughter),
The sounds of Hiawatha's laughter
Merge with those of Laughing Water.

HARRY TSCHOPK, JR.
*Assistant Curator of Ethnology
American Museum*

BOOKS

Continued from page 55

Albert Smith Bickmore to create in New York City a great natural history museum, Mr. Saunders introduces the reader to many of the scientists whose work has made the Museum famous. Through the first eight chapters the names and accomplishments of different men and women are interwoven with descriptions of the vast collections and exhibits for which they were responsible. In chapter nine, "Men of Science," a few of these individuals emerge more intimately, and to the very end of the book one is keenly aware of the human side of the Museum.

In writing this two-fold account, Mr. Saunders, who practically grew up within the American Museum and is now Chairman of its Department of Public Instruction, has followed the Museum's arrangement of subject matter in a general way. Thus, in chapters one through eight, he describes the world of natural history, illustrating and enhancing it with references to the exhibits and research work of the Museum. This very fact sometimes causes the reader to move rather abruptly from one topic to another, and in a few cases it requires some retracing of steps. But the over-all result is to give a good summary of natural history and a fascinating background of information for any visitor to the Museum, whether he reads the book before or after his visit. Exploration, research, and other behind-the-scenes activities are covered in chapters ten and eleven. Last but not least are described the ways in which the Museum interprets its work and serves as a unique educational institution.

This is the first time that anyone has attempted to bring together so much of the Museum's story. Mr. Saunders undertook an extremely difficult task and any faults are certainly minor. Those who are familiar with the older personalities of the Museum will miss the names of some and feel that sufficient recognition was not given to the work of others. This is undoubtedly due to the limitations of space and the desire of the author to present a present-day picture of the institution. The latter intention is complicated by the fact that the story of the Museum is an ever-changing one. The book is highlighted by excellent, well-selected illustrations. Unfortunately, two captions are transposed and names are reversed in another. Mr. Saunders has made available a great collection of facts concerning the world in which we live, as well as about the personalities who have gathered those facts from the four corners of the globe. This interesting combination should appeal to layman and student alike.

WILLIAM G. HASSLER

Brief comments on films previously reviewed

DOCUMENTARY AND GRADE A

The Amazing Monsieur Fabre
Life of world-famous naturalist Jean-Henri Fabre

Good insect photography, sometimes erroneously interpreted. Filmed on location in France

Ivory Hunter
One man's struggle to build an African Wildlife Park

Authentic geographically. Marvelous shots of big game. Good conservation

DOWN THE ALPHABET

The Big Sky
White traders attempt to open Blackfoot Indian territory, 1832

Blackfoot Indians portrayed with disregard for fact

The Blazing Forest
Lumber camp operations and fire fighting methods

Should be enjoyed by young people. Accurate picture of a lumber camp

The Jungle
An extravagant melodrama in which the main characters hunt mammoths in India

Pure fiction seasoned with a sprinkling of natural history and India

The Snows of Kilimanjaro
Story of a writer with a complicated personality

Some splendid African animal shots. Camp scenes unconvincing

Under the Red Sea
An exploratory film with a plot woven in

Rich and varied marine life of Red Sea shown with high photographic artistry. Narration makes false claims

restricted to any particular terrain or climate. The camel is the most popular example of a pacer. It is a creature of sandy wastes. The camel's relatives, the llama and alpaca of South America live in the high Andes and also pace. As we already know, the giraffe of the African veld paces, as does its relative the okapi, which lives in the forests of the Congo. The hyena paces and, strangely, an occasional domestic dog is found that paces. Some horses inherit a tendency to pace. This is not artificial but it is developed by the trainers.

Tapir Toes

SIRS:

Referring to "The Lady of the Lake" in your December issue, you may be interested to know that I saw the tapir, Corina, on a recent visit to Barro Colorado Island. She still comes to the laboratory clearing for handouts, accompanied by a male tapir of about her age and the deer that grew up with her. She has grown considerably, and Dr. Zetek, of Barro Colorado, estimates her weight at between 350 and 400 pounds.

When the article about Corina described tapirs as having three toes on each front foot and four on each hind, I wondered whether there was not a typographic transposition. I am sure that both Corina and her "boyfriend" have four toes on the front feet and three on the hind. The accompanying photograph



Photo by Phillip R. Houghton

by Phillip R. Houghton shows the hind foot of one of the tapirs, and although it cannot be taken as proof of this, it does give a good idea of the appearance of the feet of a tapir.

W. E. LUNDY

Balboa Heights, C. Z.

Mr Lundy is quite correct in suggesting that we put Corina's wrong foot forward. The American Museum's Department of Mammals assures us that the tapir belongs to the order of odd-toed mammals and that we needn't have made it odder by putting its forefoot where its hind foot should be.—Ed.

Photo by Hugo H. Schroder



Skunks in Traps

SIRS:

Having read with interest Horace J. Fenton's "I Rescued a Skunk" (December, 1952), I venture to offer some information from my own experience. In the last half century, I have released dozens of skunks from traps by a method that I have come to believe is the best one that can be followed. Many people probably do not realize that if you hold a skunk's tail down snug to its body it is helpless, that is, it cannot throw its essence, though it can, of course, bite. There is a tradition that you can carry a skunk safely by its tail. Well, you can, but not every time. My father, John Burroughs, did it without ill effect for a while, and then one day he got sprayed.

The safe and sane way to take a skunk out of a steel trap is first to cover the animal with old burlap bags or any spare cloth. I put these bags on the end of a pole and then, holding them out in front of me, that is between me and the skunk, carefully approach to drop them over it. Once the skunk is covered, I walk up and put my hands on it and hold its tail down. If it is a heavy trap, with a stiff spring, I always use a three-inch clamp, the sort that carpenters call a C clamp, and with this I pull down the spring and hold it secure. I usually work a bag up over the skunk until its trapped foot is in the mouth of the bag, then release the foot and tie up the bag. I then take the animal far away to release it, and the best way to do that

◀ A FIFTEEN-FOOT SAWFISH with five remoras, or sucking fish, attached to its upper side. These marine hitchhikers usually attach themselves to the under side of a fish, but since the big sawfish frequently rested on the bottom of the oceanarium, they attached themselves inverted!

➤ NOT some baleful beast of the tropics but a harmless, insect-eating bat of Europe, *Plecotus*. Its total length is only three inches

is to let the skunk slide out of the bag on the far side of a stone wall.

So far, I have never had an accident with a skunk, and I have found an almost unbelievable variation in their temperament. Some skunks will begin to throw their essence as soon as the trap catches them. I once had a skunk drag the trap a distance, and as soon as I came near, it took a shot at me with deadly accuracy. But I saw the yellow spray start, and I was able to dodge it by inches. It flew past my face. Some skunks will stamp their feet angrily. You never can be quite sure.

JULIAN BURROUGHS

West Park, N. Y.

SIRS:

I was very much interested in Horace J. Fenton's recent article, "I Rescued A Skunk," because my husband had a similar experience last summer. Rabbits, apparently, had cost us hundreds of dollars worth of garden damage, and he had set a trap.

On the morning of July the Fourth, he found the skunk in the trap. We did not have a long chain on the trap, and friend skunk would not let my husband approach. I could suggest nothing, so my husband called a friend who has had much to do with animals. He, too, was unable to advise. So I suggested that some food might help to establish friendly relations. The skunk ate the food ravenously but would not let his liberator come close.

My husband was determined not to kill the skunk, and finally he had an idea. He took a piece of very coarse netting we had for protecting grapes from birds and quickly threw it over the skunk. He then rushed in and held the animal's tail down while he released its foot from the trap.

My husband seemed a little hurt that the skunk was not polite enough to stop and thank him, but I told him it was he who should feel grateful.

MRS. F. ELLWOOD ALLEN

Bennington, Vt.

SIRS:

I discovered *NATURAL HISTORY* quite by accident about a year and a half ago, and since then have enjoyed every issue. It is beyond doubt one of the best magazines on the market today. The authenticity of the articles, the use of colored print for headings, the superb photographs and intriguing sketches along the tops and bottoms of the pages are an unending source of delight to me. The entire magazine is the very essence of good taste. There is one im-



Photo by Moreau

portant factor that outweighs all others in making *NATURAL HISTORY* the grand magazine it is. I refer to the style and language in which the articles are written. They are first-class in every respect and charmingly narrated. The simple and excellent choice of descriptive words enables me to feel that I am "living" the articles at the time of reading them. . .

JOHN BASIL BOURSOT

El Salvador, El Salvador, C. A.

To Explore the Upper Amazon

An extensive expedition to one of the least-known sections of the Amazon is being undertaken by Dr. Harry Tschopik, Assistant Curator in the American Museum's Anthropology Department, for the purpose of filling an important gap in the scientific knowledge concerning the Indians of the region.

Part of the area to be explored has

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HARRY ROSS

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never been accurately mapped. No ethnologist has visited this region since the 1920's and very little is known about what tribes will be encountered or what kind of people they will prove to be.

Dr. Tschopik sailed on January 30 by steamer to Callao, Peru. From there he will fly over the Andes to Iquitos on the upper Amazon. There he will establish a base of operations and join Raúl de los Ríos of Peru, with whom the Museum has already made an arrangement for collecting. Señor de los Ríos collected the material that is currently being displayed in the American Museum's new but already celebrated exhibit entitled "Men of the Montaña." Between the area represented by this exhibit and the region about 300 miles to the north from which Dr. Harvey Bassler secured his collections in the 1920's, lies an area from which no native tools, weapons, clothing, and the like have been systematically collected. "The bridging of this gap will give the American Museum the world's most complete collection of anthropological material from the westernmost headwaters of the Amazon," states Dr. Harry L. Shapiro, Chairman of the Department of Anthropology at

the Museum. Dr. Tschopik will make a socio-anthropological study of the Indians and will make a documentary sound film in color of the expedition and the peoples visited.

The river journey will be made in Señor de los Ríos' dugout canoe in company with three Campa Indians. One trip alone will require that the men live in the canoe for four months. Their route will fork off from various points along two of the main tributaries of the upper Amazon, the Putumayo, which forms the boundary between Peru and Colombia, and the Yavari, which flows between Peru and Brazil. Their canoe has an outboard motor and will carry two tons of supplies and trade goods, but Dr. Tschopik expects to live off the country as much as possible. Agouti and several kinds of game birds will provide much of their food, together with fish, which are abundant in many of these rivers.

At the end of his eight months with Señor de los Ríos, Dr. Tschopik expects to travel to Chucuito, a village on the shore of Lake Titicaca, to complete a study of the Aymara Indians of that locality, which he began in 1940 but had to interrupt in 1942.

WHICH ARE THE BIGGEST *Continued from page 71*

have topped twelve feet. The largest of these had a shoulder height of twelve feet, four inches. The difficulties of weighing a wild elephant, far from civilization, can well be imagined, but several in zoological parks have been weighed. One of the largest was an African elephant at the New York Zoological Park. It had a shoulder height of 10 feet, 10 inches and weighed 10,390 pounds.

Large horns and teeth are of sufficient general interest to be mentioned briefly. The Indian buffalo produces the longest horns of any known animal. A single horn in the British Museum is approximately six and a half feet long. Some of the wild Asiatic sheep, the famous *Ovis poli* and relatives, have done almost as well. The record here is six feet, three inches. The antlers of a moose cannot compete in length with the horns of either the buffalo or the sheep. On the other hand, the Alaska moose does produce the heaviest horns known. A pair of large moose antlers may weigh as much as 85 pounds.

The tusks of elephants are modified teeth, and the African elephant holds the prize for having grown the largest tooth of any living animal. The largest known pair, now in the British Museum, are from an old bull killed near Kilimanjaro in 1895. Each tusk exceeds twelve feet, and the pair are said to weigh 460 pounds. The imperial mammoth an extinct relative of the elephant, somewhat exceeded these measurements in tusk length. One of these tusks, now on exhibition at the American Museum, is slightly more than sixteen feet long. Skeletons of the imperial mammoth that have been recovered show that in life some of these creatures were probably fifteen or sixteen feet high.

Of course we have nothing as large as the imperial mammoths on earth today, and some of the extinct dinosaurs were even larger. On the other hand, we must not forget that the sulphur-bottom whale, still very much alive, is the largest animal that ever lived. So we need not believe that the world has become a dull place to look around in.



Indians

OF NORTH AMERICA

by HARRY TSCHOPIK, Jr.

SCIENCE GUIDE No. 136

\$1.50 postpaid

An absorbing panorama of life on the North American continent before the coming of the white man. Harry Tschopik, Jr., Assistant Curator of ethnology at the American Museum of Natural History, performs a valuable service for all who are interested in the fascinating, but often confusing, kaleidoscope of tribes, origins, languages, and customs that existed here long before Columbus.

How many Indians were there—in how many tribes? Where did they come from? When? How? How did their cultures differ, and why? Which were the most warlike? Which the most advanced? Which the most closely related? What is their status today? Are they all disappearing? **INDIANS OF NORTH AMERICA** is a storehouse of answers to questions such as these. In highly

readable style the author brings order to the Indian jigsaw puzzle—builds a clear picture in which every element is seen in proper relation to all the others. Replete with illustrations, drawings and maps, this enlightening new publication will be treasured by everyone for the clear perspective it gives of so large, complex, and interesting a subject.

INDIANS OF THE MONTAÑA

by Harry Tschopik, Jr.

Science Guide No. 135 • 80¢ postpaid

In the dense tropical rain forest of eastern Peru and Ecuador live several related tribes of primitive Amazonian Indians. Here, in one of the most isolated areas of the world, man still clings to modes and mores as elemental as Nature itself. But, with air transportation and the white man's relentless search for raw materials, this last frontier is being opened to modern agriculture and colonization. Mr. Tschopik's engrossing study of these peoples gives the reader a good last look at a fading scene—an aspect of human existence that will soon be history.



Man and Nature  *Publications*

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But it was Mr. Patterson who was at work on one of the firm's die-casting machines the day an elbow on the discharge line of the hydraulic system let go. The hydraulic fluid sprayed over the machine and a nearby zinc melting pot, drenching the operator and half a dozen other workers.

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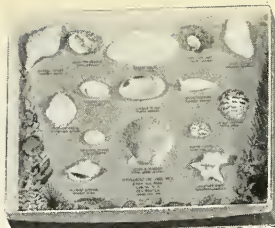
March **NATURAL HISTORY** 1953

Movie-making among Brazilian Indians · Pacific Birds

Dinos on Display · The Cobra Plant · Helpful Insects



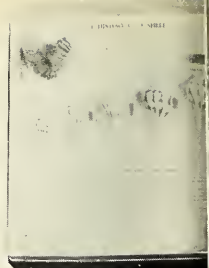
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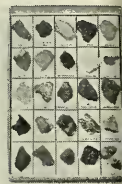
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Opossum photo by Lynwood Chace

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LETTERS

Strange Tree of Heaven

SIRS:

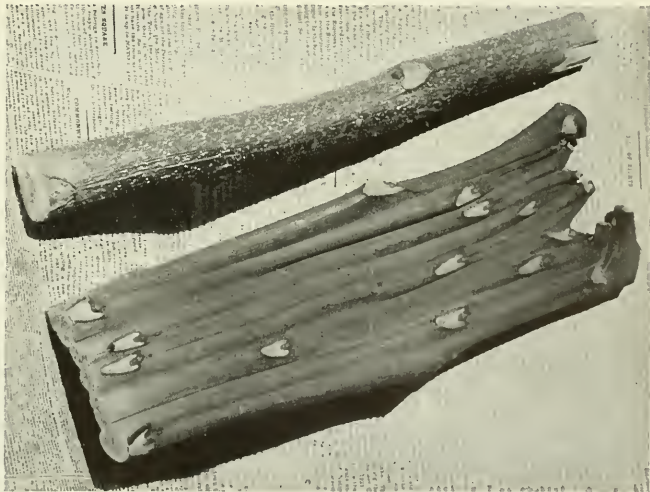
I wonder if you would be able to advise me about this strange specimen of what I believe to be the "tree of heaven." Is it unnatural, and if so, what causes it? A friend of mine found this in Summit, New Jersey.

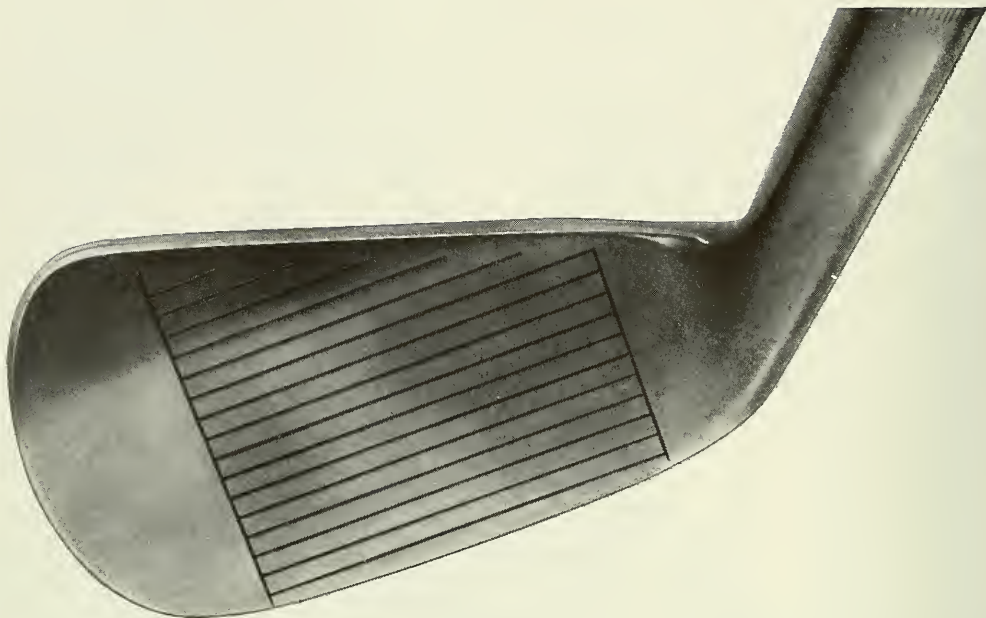
JOSEPH L. PARKHURST, JR.
Colonia, N. J.

The following remarks are offered by Richard H. Pough of the Museum's Conservation Department:

The curious form of this "tree of heaven," or *Ailanthus* tree, is known as fasciation. It is apparently due to a disturbance of the hormonal processes of the plant whereby the apical cells—those of the growing tip—fail to exert complete dominance and a second growing tip

Continued on page 140





Who helps steel follow through?

How banks help steel companies supply the nation's needs

GIVEN A MOUNTAIN of iron ore, a roaring steel mill, a thousand skilled workers and a corps of production experts . . . you might be able to make steel for a number six iron.

You might. But—

Steelmaking takes money . . . lots of money!

That's why many steel men turn to banks for short-term loans that help—mine the iron ore, transport it to processing centers, convert it into steel, and market it to manufacturers of consumer and industrial goods.

In addition, bank loans help steel companies pay for such things as plant expansion, equipment modernization . . . metallurgical research.

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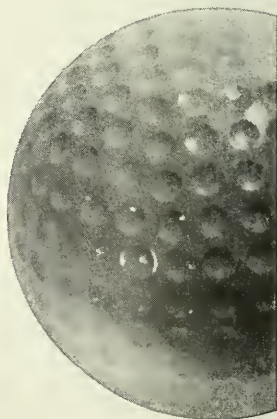
But, there's more to it than that. When money works, men and women work, too . . . the community's wealth increases, and people live more prosperously . . . more securely.

Few industries illustrate this better than steel, and we believe that America's banks make a real contribution to the whole nation's progress when they, "help steel follow through."

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March, 1953

Volume LXII, No. 3

Brazilian NativesCover Design

From a color photograph by Zygmunt Sulistrowski

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To Capture a Dinosaur Isn't Easy.....Roland T. Bird 104

To climax this brilliant exhibit in the American Museum the dinosaur hunter had to bring back the tracks as well as the dinosaur

The Baleful Cobra Plant.....Mildred J. Ericson 111

Everyone knows of insects that eat plants. Here is a plant that eats insects

Insect Commandos Aid the Orchard.....Weldon D. Woodson 112

How scientists save fruit growers millions of dollars by finding insects that will kill other insects

Mother Mako.....John M. Olin 118

Perhaps the only time an angler ever took eleven fish on one hook—and gained a few facts of life in the bargain

Pacific Bird Life in the Whitney Memorial Hall..... 120

More than 1000 islands were explored in a 24-year program to bring the public this exhibit in the American Museum

City of the Cavemen.....Nell Murbarger 124

A metropolis of man-made grottoes tells a dramatic tale of ancient life in New Mexico

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Motion picture problems among a group of Brazilian Indians

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Authentic comments on films in the field of nature, geography, and exploration

You will find NATURAL HISTORY indexed in Readers' Guide to Periodical Literature in your library



THE COVER THIS MONTH

These three Indians of the Camayura tribe live in the region of the Upper Xingu River. The Xingu flows northward from one of the least known parts of Brazil to join the Amazon. Their village of about 90 souls is hundreds of miles from the nearest civilized settlement.

The men have made themselves ready for a ritual dance that is celebrated each year just before the beginning of the rainy season, which usually lasts from December to April. They have had little contact with the outside world, and all the decorations on their bodies were made in accordance with the time-honored traditions of their tribe. The coloring was achieved entirely by the use of plant juices. After the beginning of the rainy season, elaborate ceremonies will not be held, so this is an important occasion in the village.

The photograph was taken by Zygmunt Sulistrowski, whose article on this region appears in this issue.

Publication Office: American Museum of Natural History, Seventy-ninth St. at Central Park West, New York 24, N. Y.
Magazine subscriptions, membership applications, and advertising inquiries should be addressed to George M. Rowland, Jr.

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T. Donald Carter

Introduction by Harold E. Anthony.
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92 pp., 40 plates

IN this handsome volume, a fresh approach to the delineation of animal forms appears. The silhouette, in an illustrative sense, certainly is not new but under the skilled knife of Mr. Mochi it has been developed into an art form of intriguing interest and potentiality. Movement, balance, and depth have been incorporated with complete success and with no loss of accuracy.

Mr. Mochi's skill in his chosen medium is so incredible that the viewer is likely

to become totally lost in admiration of the technique alone. And no wonder, for the open, lacey effects in many of the figures seem beyond the ability of the sharpest knife and the most agile fingers. But calmer consideration reveals intrinsic advantages not evident at first glance. The artist will tell you that his method produces an effect that he feels to be "satisfying." More objectively, there is the pure, sharp edge, of a nature specific to the knife. Also, as Donald Carter points out in his preface, with the elimination of color as a factor in distinguishing one animal from another, the entire emphasis falls upon form. In less meticulous hands, this accent would most certainly have prevented a result as satisfactory. As presented by Mr. Mochi, characteristic differences in form, however subtle, have been carefully depicted. Plate XV shows thirteen kinds of the

tiny antelopes known as Duikers. Off-hand, they look as much alike as thirteen peas. But closer inspection reveals the curious hairbreak on the rump of the Yellow-backed, and the outline of the reposing Chestnut is so completely typical that it could not be mistaken for another. The careful keying to size will readily break down the others.

As might be expected of a scientist as modest and self-effacing as Donald Carter, he has kept his text to the minimum. His obvious wish not to overwrite has resulted in terse, abbreviated accounts, which are well and soundly done, containing the kernel of what is to be said, without embellishment. In one of the few instances where he has allowed himself to wander briefly to recount personal anecdotes, he says, on the page facing Plate XXIX:

"One morning, while crawling through





*These four reproductions from
"Hoofed Mammals
of the World"
illustrate the remarkable
artistic effect that Mr. Mochi
achieved with his skilled knife*





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a particularly dense thicket on my hands and knees, I came face to face with a leopard." Period, end of anecdote—it was intended only to illustrate the difficulty of a terrain. That, I think, is the essence of the spirit of a man whose experience in seeking and finding mammals in the wilds, the world over, has been equalled by few.

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LEE S. CRANDALL

POSSUMS

----- by Carl G. Hartman

University of Texas Press, \$6.00
104 illus., 174 pp.

CARL HARTMAN gives us the opossum, its life, its nature, its history, and its association with man in a beautifully illustrated and handsomely bound de luxe quarto edition. Every aspect of the lowly opossum is carefully reviewed by this genial scientist who has studied its peculiarities for over 40 years.

While the opossums as a group are reviewed in general, Dr. Hartman has starred the common American species as his leading character. He dwells for some length on the folklore of our marsupial and the part it played in the Age of Credulity. He trails the opossum through history and has reproduced many of the quaint and the earliest pictures of this animal that tell an entertaining story in themselves. Few of us realized that the American opossum was the first pouched mammal known to western civilization. Dr. Hartman tells us that in 1500 the explorer Pinzón took one back with him to Spain and presented the "incredible mother" to the astonished monarchs, Ferdinand and Isabella, who placed their royal fingers in the opossum's pouch and marveled at so strange a contrivance of nature. The western world, we find, did not learn about the kangaroo cousin until the return of Captain Pelsaert, who was shipwrecked on the treacherous coast of Australia in 1629.

The nature lover and natural scientist will find here entertaining reading about the opossum at home and details of its wanderings, its likes and dislikes. The exaggerated uses that the folklore opos-

sum makes of its tail are discounted. Dr. Hartman gives the facts about the opossum's method of counterfeiting death and brings out the fact that the opossum does not own the exclusive rights to this phenomenon; death feigners occur among the dogs, as well as in the kangaroo family.

The embryology of the opossum is presented in pictorial review, and the journey to the pouch—fancy versus fact—is fully documented. Life and development in the pouch is well illustrated; and popular aspects, such as opossum hunting, are included. Finally, the opossum is served as a savory dish for guests in the South.

Possums has its humorous side, and Dr. Hartman is certainly thoroughly acquainted with his subjects. He speaks with authority and is exact in presenting his facts. The scientist will find this book as useful as the casual reader will find it entertaining and informative. There is a valuable bibliography and a useful index in the back of the book.

G. C. GOODWIN

THE WONDERFUL WORLD OF INSECTS

----- by Albro Gaul

Rinehart & Co., \$4.00
290 pp., 47 pp. of photos

ANYONE who attempts to write about the world of insects is immediately confronted with tremendous problems. The field to be covered is so vast that it is difficult to select those aspects of insect life that will appeal to the reader, not to mention insect types that will best serve as examples of each of the chosen categories to be discussed. In this work, Mr. Gaul has selected sixteen phases of insect life in order to show the development of insects themselves, their relations to each other, to man and other animals, and to the plant kingdom.

It is generally agreed among entomologists that man could not exist upon earth without the presence of insects, but few nonscientists realize the extent to which man is dependent upon them. Most fruits, vegetables, cereals, and other foodstuffs are dependent upon insects for pollination. In return for producing these, certain insects take a toll of our crops and become "pests." In the group

Continued on page 141

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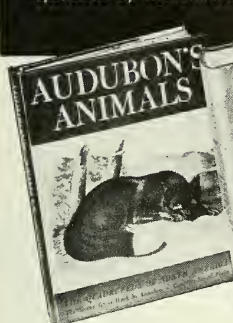
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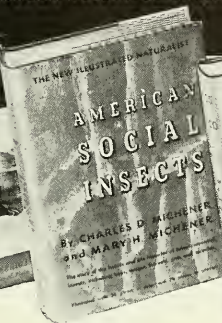
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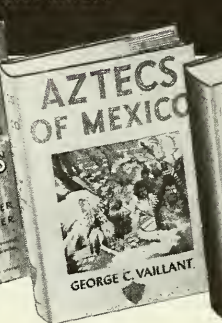
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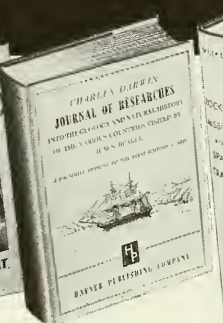
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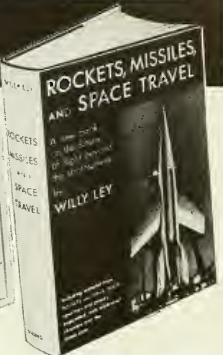
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▲ AFTER 135 MILLION YEARS, the brontosaur appears to walk again. The trail behind him was left in thick mud, which was flooded with enough water to float the long tail. The tail has been switched to one side so that the tracks can be more readily seen

ONCE I had thought that quarrying the big tracks was the toughest job a dinosaur hunter had ever tackled, but I began to suspect I had another think coming.

When American Museum officials decided to regroup three spectacular dinosaurs to form a new type of exhibit, Curator Edwin H. Colbert remembered a 15-ton pile of

unopened, rock-filled crates in a courtyard of the Museum. "Let's unpack Bird's big sauropod trail and get it mounted behind *Brontosaurus*," he said, starting the final phase of the biggest and most unusual undertaking of its kind ever attempted.

I recalled how, on a cold November afternoon many years before,

I had shoveled dry river silt from a sauropod trail near Glen Rose, Texas. The round forefoot impressions of this most gigantic animal ever to walk on earth were huge, but the great turtle-like hind prints, averaging over a yard in length, stood out in a wide rock ledge like a double row of sunken wash-tubs.

To capture a DINOSAUR *isn't Easy*

The hunter for prehistoric animals had to bring back the footprints as well as the animal in order to climax this brilliant exhibit, soon to be completed at the American Museum

By ROLAND T. BIRD

*All photographs by the author
except where otherwise credited*



▲ WHEN the overburden was removed, this pair of trails was revealed. The large ones were made by a brontosaur, the small ones by a three-toed flesh-eating allosaur, possibly in pursuit of the larger creature. Both trails were disclosed when the footprints visible at upper left were followed underground

◀ YOUNG TOMMY PENDLEY, son of a worker on the project, took an impromptu dip in a big dinosaur footprint. The print held 18 measured gallons of water



▲ THE LONE COW stands on the ledge from which the tracks were excavated. The biggest of the dinosaurs that passed here could easily have reached up and fed on the leaves of the tall tree at left



▲ HERE the expedition workmen are breaking up a section of rock 30 feet long and 10 feet wide so that the dinosaur tracks can be shipped to the American Museum and reassembled



It had been a thrill to discover them, but it was a bit disappointing that at the moment I could only attempt to make plaster casts of one fore and one hindfoot impression for the Museum. The rock ledge containing the tracks was barely above water in the broad bed of the Paluxy River. As rain threatened, I knew I must get at the task that very evening if I were to escape a possible flooding. In my car, there was plaster enough only for ordinary fossils. To secure an additional 100-pound bag I would have to dash to the nearest lumberyard. To act as a separator between the setting plaster and the porous rock, I estimated I would need a couple of gallons of thin oil.

At ten o'clock that night, with rain still threatening, I ran out of the calculated amount of oil and had yet to cast the second track. There was but one quick alterna-

tive, to rob the car's crankcase and hope that enough would be left to get the car to town.

In the morning I managed to drag the heavy casts up the 30-foot embankment of the river and lashed them to the top of the car, where they looked like a couple of white boats.

Mr. J. D. Wilson, owner of the adjacent farm, watched me drive into his yard in open-mouthed amazement.

"I've lived next to that Paluxy for sixteen years," he said, "but I never dreamed there was anything like that down there."

A neighbor said, "You know, I've seen those big footprints lots of times. But I always thought they were just big potholes. Many's the time I've caught catfish trapped in them."

In the American Museum, Dr. Barnum Brown, now Curator Emeritus of Fossil Reptiles, soon

laid plans for me to secure a large section of the rock holding at least 12 tracks. As enthusiastic as if he had made the find, he declared that such a set of footprints behind the big brontosaurus would create the impression that the creature was alive and walking right across the floor.

How to get them out

The financing of large dinosaur-collecting projects is seldom accomplished overnight. Two years later, with the Sinclair Oil Refining Company contributing aid, the work was undertaken. The aid and co-operation of the University of Texas was also secured. Under this mutual plan, the University was also to receive specimens.

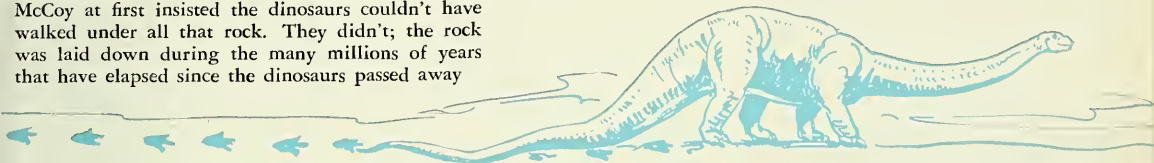
On a bright warm April morning I arrived again on the Paluxy to start a ten-man crew at the initial job of damming the river so as to expose more of the ledge



▲ THE HARD LIMESTONE LEDGE behind this worker lay immediately above the dinosaur tracks. Worker McCoy at first insisted the dinosaurs couldn't have walked under all that rock. They didn't; the rock was laid down during the many millions of years that have elapsed since the dinosaurs passed away



▲ NEWS of an impending flood set the men to strengthening the quarry dikes in the Paluxy River. But the rise swept six feet higher than the highest sandbag and delayed the work



where the prints had been discovered. This uncovered additional tracks, but after about 28 twelve-foot strides, the trail disappeared under the heavy limestone and interbedded clay that had been deposited on top of the footprints over 100 million years ago. To obtain good tracks not worn by the river, it was obviously necessary to quarry away this overburden.

At the end of three weeks, we had struck a huge, new trail that paralleled the first. Every footprint was as sharp as the day it had been made. But even as we stalked this new monster, we faced our first real trouble. Spectacular dinosaur work in the field has always resulted in widespread newspaper publicity. So here as elsewhere, the sightseeing public came, pushing loose dirt down the banks and plaguing every worker with endless questions.

The Glen Rose quarry was cer-

tainly unique, and we couldn't blame the "sidewalk superintendents." And though their questions were sometimes trying, I truly reveled in their opportunity to see what was now exposed. Both the witnessing public and the workers, excitedly following the new trail, had a field day.

We were following the dinosaur around a slight turn that he had made, when heavy rains flooded the river. The rising, raging stream swept five feet above our highest sandbag dike. Away went the bags as though filled with sawdust. Above the vicious churning I could hear large rocks thumping across the muddy water-hidden trail. For several excruciating days I wondered about the damage, as we waited for the quieting waters to silt the quarry with tons of mud before receding.

With the finding of this finest of all trails, which we had un-

covered intact, I resolved to abandon further effort to find other footprints and to concentrate on getting these out of the ground. It was early in June when we began cutting channels through the heavy 16-inch rock, blocking out ten yards of trail for the exhibit in the American Museum and a smaller section for the University of Texas. I didn't worry about getting all this heavy tonnage up the 30-foot embankment. We would just break the blocks into movable pieces, record their relationships on charts, and sweat over the reassembly problems later.

An accident

This same week a new difficulty nearly cost a worker's life. For the purpose of channeling through the heavy rock, I had fashioned from old Ford axles a half dozen very long chisels. One workman would sit on the ledge and hold

such a tool while a partner stood above and struck it with a long-handled 10-pound sledge hammer. To be clear of the dangerous arc of the descending hammer, I also provided long holding clamps for the chisel men. But to most, these safety measures seemed a nuisance; they became lax in their use. I cautioned them repeatedly about this, but I couldn't watch every man every time he picked up a chisel.

I was at the far end charting footprints when the accident occurred. One moment the air behind me was filled with the rhythmic clang of steel on steel and steel on stone from several scattered positions; the next came an odd false clang, a sickening crack, loud shouts, and a great dropping of tools. I turned to see Oscar Moxon, a stout little man with a red face, lying slumped motionless in a pathetic heap beside one of the great dinosaur tracks. Standing above him was William Monroe Eaton, tall, gaunt, whitefaced, still holding the sledge that had glanced from Moxon's chisel-head and come smashing down upon his temple. Instant death seemed to have resulted from the terrific blow.

Someone dashed a bucket of water over Moxon's head. As though in a horrible nightmare, I hurried to help the others move the limp, drenched form into a more comfortable position. He still appeared entirely lifeless. At last a hand twitched.

A worker, breathing hard, said shakily, "Aw, he's all right. Old Mox is just too tough to kill with a sledge."

Moxon recovered fully. But for me there will always be in the brontosaur trail one footprint be-

side which I can never forget that nightmarish dead form.

Summer's end saw some 40 tons of track-bearing rock safely lifted from the river bed. Twenty-two tons went to the American Museum, including an additional "spare" section requested by Dr. Brown and a smaller section for Brooklyn College. The brontosaur tracks had been removed in 118 numbered sections. Needless to say, I was quite satisfied with the outcome. Fortunately I could not foresee the future.

Giant jigsaw

A long line of groaning trucks brought the material from the freight yard to the Museum in New York City. No storeroom was available for such a pile of crated blocks. I watched six men of the Custodian's Department stack them in a dark corner of the open Service Court and cover them with canvas, hoping that the Museum would have funds to complete the work sometime in the near future.

If the job ahead hadn't been so huge and if other unforeseen factors hadn't interfered, the tracks might have been reassembled sooner. As it was, when the somewhat ragged canvas was stripped away last April and the blocks were spread out in the exhibit hall beside the 81-foot receiving base, I realized that there was some jigsaw fitting to do. No permanent damage had been done to the 135-million-year-old tracks, but some of the numbers had washed off. I only hoped I would not have too much trouble getting the footprints back together again.

The irregular central island was a magnificent mounting for the three great dinosaurs. The brilliant

rays of 48 concealed overhead lights would illuminate the creatures against a beautiful new background of deep blue walls.

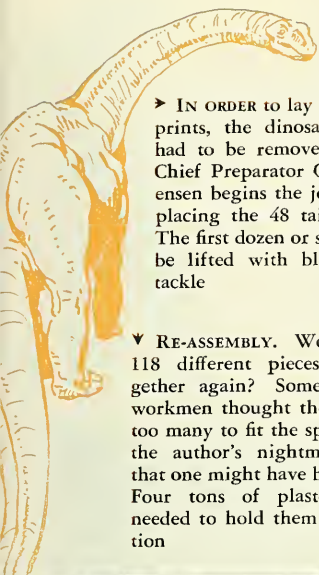
Mr. M. F. Harty, Assistant Director of the Museum, placed at my disposal big, pink-cheeked Paddy Grady and husky ex-coal miner Gwynne Payne, stone masons, with the privilege of asking for additional help as needed. Big Paddy, with arms and shoulders like Longfellow's Village Smithy, thought nothing of heaving the heaviest pieces around. He only looked doubtful at the size of the area into which all were supposed to fit. "Didn't you bring back a few too many?" he asked gently.

While the men stripped off the old protective plaster jackets and cleaned the original surfaces of the stones, I tried to re-identify the pieces with lost numbers. The next week, with some of the doubt cleared away, I faced the setting together of the starting track. But just as an audience had always been attracted in the field, so the crowd was starting to gather here. Half the Museum staff, it seemed, was on hand to watch my down-



➤ A LOCAL DINOSAUR TRACK MARKET was operated by Jim Ryals, who had for years quarried and sold the abundant carnivore tracks to rock gardeners. The price of \$25 a print kept sales low, even during the influx of sightseers to the expedition camp. The chains were to keep the dino tracks from walking away with some midnight souvenir-hunter





► IN ORDER to lay the footprints, the dinosaur's tail had to be removed. Here Chief Preparator Carl Sorensen begins the job of replacing the 48 tail bones. The first dozen or so had to be lifted with block and tackle

▼ RE-ASSEMBLY. Would the 118 different pieces fit together again? Some of the workmen thought there were too many to fit the space; but the author's nightmare was that one might have been lost. Four tons of plaster were needed to hold them in position



fall as a jigsaw solver. Even the visiting public, in an unprecedented move by the Museum, were admitted to one side of the long hall.

Piece by piece, week by week, the great trail began to go together. On three different days, Paddy and "Whity" tried one huge 500-pound fragment in three different places before it would fit. To hold dozens of such assembled pieces level and in contact, it was necessary to pack plaster-saturated excelsior into irregular spaces underneath. After we had used up some 6000 pounds of plaster in this manner, I saw Harry Farrar, mason foreman, shake his head. "I never figured on this kind of tonnage," he said.

By mid-June, we had enough of the 300-square-foot puzzle together

to make sense, but it was evident I still faced weeks of work before the hundreds of cracks between the blocks could be pointed up with plaster colored to match the rock. I thought of this as the last problem until I realized the importance of Chief Preparator Carl Sorensen's job of remounting the brontosaur's ten-yard tail. It had been removed during the assembly of the trail, and had to be hung in a new position.

Shadows from its 48 bones were a serious consideration, for they

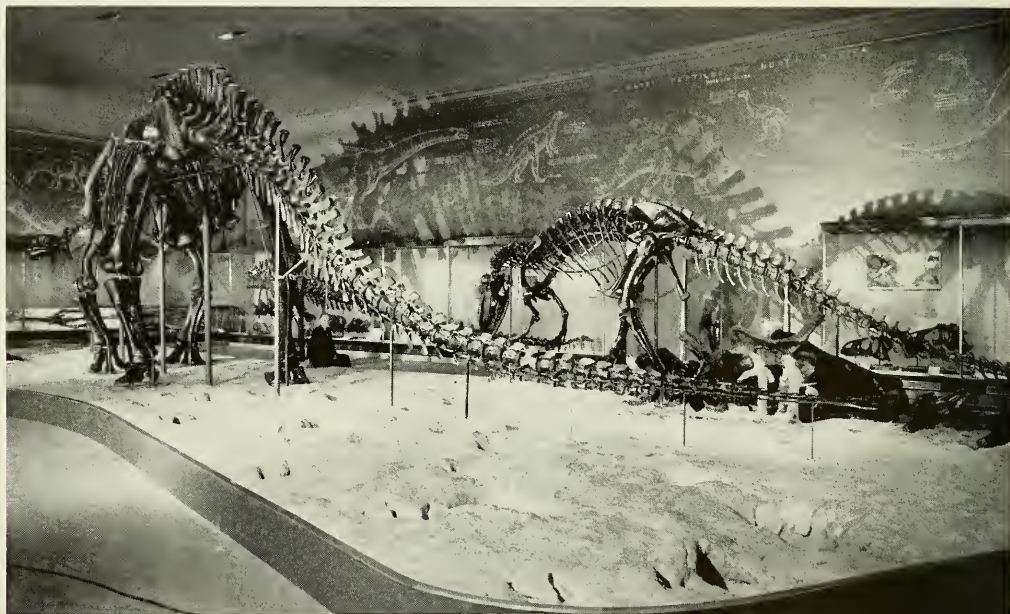
obliterated the pattern of the tracks. We were surprised that the tail could be mounted in so many ways and still cast shadows in unfavorable places.

Close to the time for reopening the whole hall, I heard a bright little boy ask, "Why did you take all the skin off the dinosaurs?"

He was standing beside me, looking up at the brontosaur, which filled the air above like the long frame of a steel suspension bridge. I had to admit that it looked as though someone had stolen the

hide. But I explained that you only found the bones as a rule, very occasionally a skin impression. Then I showed him the footprints that had been made by a living dinosaur with its skin on. Four double twelve-foot strides had carried the creature to a position like that of the mounted skeleton.

Well, the big dino may not be in the flesh, but he's surely striding along like the honest-to-goodness giant he was, stepping out of those 135-million-year-old tracks, into a very modern setting indeed.



SIX HUNDRED PERSONS could stand without crowding in the space occupied by the tracks and the skeletons of the dinosaurs. The smaller dinosaur at right was the three-toed meat-eating type, which seems from the tracks to have been pursuing the large brontosaur. The latter is 67 feet long, 15 high, and weighed around 30 tons.

This is the largest single piece of terrain ever to be shown from the Age of Reptiles. Eighteen footprints are prominently visible, others less distinct. The stones containing the track, with their interbedding of plaster, weigh close to 19 tons



The Baleful Cobra Plant

Everyone knows of insects that eat plants.
Here is a plant that eats insects—and it
has a State Park in its honor

By MILDRED J. ERICSON

Photographs by the author

▲ THE THING that reminds one of the darting tongue of a serpent is actually a landing field for winged insects. Attracted by a sweet scent, the insects enter the door through which the many translucent windows are visible in this photograph. Then they plunge to their death down the long tube



IF animals could read, State Park officials would post a sign saying "Insects Beware—Danger" at Darlingtonia State Park, Florence, Oregon. For in this sphagnum bog grows this unbelievable Pitcher Plant, *Darlingtonia californica*, which catches insects in its hollow leaves and eats them.

These curious flesh-eating plants can be seen from one's car on Coast Highway 101, 5½ miles north of Florence. But a walk of

YOU CAN SEE THEM from the car, but a short walk will put you in the midst of the assassins. They look for all the world like thousands of cobras ready to strike. But they are harmful only to insects



100 yards back from the road will offer a more spectacular sight—thousands of hooded “pitchers” massed like a river of strange cobras, ready to strike their prey. The plants are harmful only to insects, so you need not hesitate to draw close. And if you’re patient, you’ll see one of the insects disappear into the “stomach” of the plant.

The so-called Cobra Plant, or West Coast Pitcher Plant, is cunning in its method of trapping unsuspecting victims. A reddish, forked appendage serves as a “landing field” for winged creatures. Attracted by a sweet scent and by glassy, translucent “windows” in the dome of the leaf, insects enter through a mouthlike opening. Once inside, they slide down the smooth surface, and stiff hairs pointing downward like daggers prevent their escape upward. At the bottom of the tube they drown in a pool.

Bacteria aid in digesting the animals, releasing nitrogenous materials to the plant. However, only the soft parts of the animals can be “eaten,” and an accumulation

of legs, wings, and exoskeletons is left at the base of the leaf. These insect graveyards may readily be examined by slitting open any leaf. Three or four inches of accumulated corpses are buried at the bottom of every mature leaf.

Bog soil is lacking in nitrogen, and botanists believe the carnivorous plants gain their supply by this devious device.

In early June, stems a foot high bear spectacular flowers with reddish-purple petals and lime-green sepals. Conspicuous, erect seed pods follow the bloom. The tubular pitcher leaves can be seen all year long.

The Cobra Plant is very limited in its range. It occurs only in coast bogs in northern California and southwest Oregon. Darlingtonia State Park, near Florence, is about its northern limit.

W. D. Brackenridge, a young Scottish botanist and a member of the Wilkes expedition to Oregon in 1841, discovered the pitcher plant when he was escaping from hostile Indians. All he could grab was a stem with a few leaves and a seed vessel. These were sufficient for the eminent botanist Dr. Torrey to determine the plant’s classification. Years later, Dr. Torrey, with a better specimen, was able to complete his analysis, and he named the plant *Darlingtonia*, in honor of Dr. William Darlington of Pennsylvania, a retiring but tireless worker in the field of botany.

This area was set aside as a State Park when it was learned that individuals were pulling up hundreds of plants and selling them as “Cobra Lilies” (they’re not lilies at all), with the fantastic claim that they would “catch all the flies in your house.” Now the plants are preserved by state protection.

Pitcher Plant Park, embracing about 16 acres, was set aside in 1946. Oregon can thus boast of one of the most unusual state parks in the nation—one that features not a scenic vista or a place to spread a picnic lunch but, of all things, a bog containing meat-eating plants and insect graveyards.



How scientists
pursue one of the most
exciting searches on earth
to find insects
that will kill other insects
and thus save
fruit growers millions of
dollars each year

ON September 30, 1942, agricultural officials making a routine inspection of a peach orchard in Southern California’s Orange County found an insect larva that differed from any they had heretofore collected. When they identified it as the oriental fruit moth, the State’s economic entomologists and agricultural administrators were alarmed.

They knew well that since 1915, when this moth was first discovered in the United States near Washington, D. C., it had built up a record of increasing destructiveness to

➤ RICH CITRUS GROVES in California. Should a destructive insect slip by the quarantine, it might take another insect to halt the damage. The mealy bug might have cost orange growers a million dollars a year had not science found its match

▼ AT THE BOTTOM of the tube, a mass of indigestible wings, legs, and exoskeletons are found in every mature Cobra Plant—all that remains of the many meals the plant has consumed



INSECT COMMANDOS

Aid the Orchard

By WELDON D. WOODSON



► BUILDINGS of the Citrus Experiment Station at Riverside, California, with experimental orchards in the foreground. It is here that many of the discoveries in the war of insect-against-insect are being made



peaches. As an indication of the extent of its damage, in South Carolina it has rendered 12 per cent of the peaches unmarketable. In some eastern orchards the losses to individual growers have reached 50 to 100 per cent.

The wormlike larva of this moth burrows into the tips of growing shoots, causing the terminal leaves to wilt and die. Or it tunnels into the fruit itself, producing the well-known "wormy peach." It had now spread from the Atlantic seaboard to the Pacific coast. In view of California's extensive production of late canning peaches, it looked as though the fruit growers were in for a hard time.

Having fought off other marauders, however, the officials were not slow in rallying their forces to combat this one. Within a few months, California's State Legislature appropriated to its Department of Agriculture over \$800,000 for the eradication of the moth. If eradication proved impossible, research was to determine how to control the pest, either by chemicals or natural enemies. The latter method is known as *biological control*.

A survey showed that the moth was already so widespread in the peach-growing area that it would be impractical to attempt to destroy it entirely. It would be better to try to prevent the insect from spreading into uninfested districts and to devise methods to control it. Thus began the effort to discover an insect that would kill the fruit moth larvae.

The State already had the facilities to conduct the program—at the Citrus Experiment Station of the University of California, established in 1913 a few miles south-

east of Riverside on U. S. Highway 60. Comprising more than 700 acres, about 400 of which are under cultivation, this agricultural research center is a mecca for students and investigators from various subtropical regions of the world who are interested in agricultural chemistry, orchard management, plant breeding, plant pathology, plant physiology, and entomology. Its director, Dr. A. M. Boyce, heads a full-time staff of 60 members, with a clerical, field, and maintenance force of approximately 145.

The task of propagating a suitable insect ally to ward off the destructive oriental fruit moth fell to the Division of Biological Control, its chairman then and until recent retirement being Professor Harry S. Smith. Professor Curtis P. Clausen now occupies that position.

Fortunately, as early as 1917 a native ichneumon "fly," *Macrocentrus ancylivorus*, in reality a wasp, was observed to be playing an important part in the natural control of the moth in a limited area on the Atlantic coast. By 1929, this insect had clearly shown its worth from southern Connecticut to southern Virginia by destroying as high as 90 per cent of the larvae infesting the twigs. As the oriental fruit moth spread westward, the United States Bureau of Entomology and Plant Quarantine nurtured the parasite in their laboratory at Moorestown, New Jersey. In co-operation with the various

state agencies, they liberated it wherever the fruit moth advanced in sufficient numbers.

Rusty-yellow in color and about equal to a mosquito in size, the female of this ichneumon fly possesses an ovipositor about as long as her body. When ready to lay her eggs, she crawls over the twig or fruit until she finds the web or excrement of the larva. She then unsheaths her ovipositor and with it locates the hole by which the larva burrowed in. Her ovipositor contacts the larva, and she quickly pierces its skin and injects into its blood a minute egg. As soon as the egg is immersed in blood, it begins to absorb food. In time it hatches, and the fruit moth larva is ultimately killed.

The value of this fly can best be realized by the fact that under proper temperatures the female can lay eggs approximately 24 hours after emerging as an adult, and her average life cycle is about 34 days, during which she may deposit over 500 eggs. She may waste more than one egg on one fruit moth larva, but still the destruction is great. When released in an orchard, she searches diligently for infested trees. After depositing eggs in one locality, she may travel as much as six miles to other trees.

With the value of such an "air force" apparent, the University of California set out to find a way to produce many thousands of the parasites cheaply enough to make their introduction into orchards



◀ **HEALTHY TREES.** Like other growers, Albert Yank of San Fernando values the work done by entomologists in establishing pest-destroying insects

practicable. Eastern entomologists had worked out methods of raising them satisfactorily there but had not succeeded in maintaining a year-round army that would be available at a moment's call to battle.

The California scientists had no difficulty in obtaining from the Moorestown laboratory enough of the parasites to launch their experiment. But what they needed was a breeding host and a type of vegetation that would be available any month of the year.

Professor Harry S. Smith suggested that the potato tuberworm (*Gnorimoschema operculella*) might be the host most adaptable for bulk production of the ichneumon fly. This worm had invaded the insectaries and had been raised unintentionally in large numbers back in 1916, when entomologists were growing potato sprouts in an altogether different experiment.

This method of producing the

beneficent parasites proved successful, for in 1946, almost 29 million were produced and about 23 million were shipped to orchardists in 14 counties. Compared with the potential good they could render, their cost was extremely low.

Either because of the "home-grown" armada of ichneumon flies or for other reasons, the oriental fruit moth has not built up appreciably in California since then, aside from a few backyard trees in Orange County. It is difficult to evaluate the parasite's work accurately, because it is hard to get enough of the destructive larvae to show which have been parasitized by it and which have not. At any rate, should hordes of the moths attack the great commercial peach-growing areas of the State, the University of California Citrus Experiment Station has at its command the assembly line to produce a redoubtable natural enemy.

Another recent contribution of

the Citrus Experiment Station had to do with the California red scale. For more than half a century, this scale, *Aonidiella aurantii*, had annually wrought great damage on the trunks, branches, and foliage of citrus trees. In several test orchards it was shown that it might be possible to reduce the infestation by means of two species of tiny wasps. These were the so-called golden chalcid "fly" and its relative from China, *Aphytis* "A." These wasps parasitized the scale and also killed many of the invaders by sucking the body fluids through a strawlike wax tube formed with the aid of the ovipositor. This was the first indication that the scale might be satisfactorily controlled by methods other than the use of insecticides.

The Station further learned that under favorable conditions the wasps may control the scale much more cheaply than insecticides. When production methods are refined still further, it may cost less than \$40 to raise 400,000 wasps—the quota per acre necessary to give biological control in all but heavily infested groves during the first year after the insecticidal treatment is stopped. Control by insecticides costs approximately \$50 an acre. In addition, the use of insecticide is a yearly proposition, whereas the insect "police," once they are generally established, will increase through natural reproduction, thus taking the strain off the insectary. In many groves, a natural balance may then ensue.

The control of agricultural pests by moving beneficial insects from place to place had its recorded beginning as early as 1775, when a report by the Swedish naturalist Peter Forskal was published post-

humously. In 1761, he had accompanied Carsten Niebuhr, a German traveler and explorer in Danish service, on an expedition that was to take them to Egypt; but two years later he died of plague in Arabia. According to Forskal's account, the date palms at Yemen in the southwest corner of Arabia were often destroyed by ants. To control them, the growers each year brought down from the mountains colonies of another species of ant which, when placed on the trees, killed the objectionable ones.

The use of beneficial ants to protect orchards from insect pests has long been practiced in Asiatic countries. A report in 1936 says citrus growers of south China put bamboo runways between the trees to aid the ants in their movements from tree to tree.

Almost a century passed after the publication of Forskal's report before pest-killing insects tested by bona fide scientists were transported from one country to another. In 1873, a mite (*Tyroglyphus phylloxerae* Riley) was shipped from the United States to France for the control of the grape phylloxera. In the next year, the ladybird (*Coccinella undecimpunctata* L.) was introduced into New Zealand from England. A third insect, *Apanteles glomeratus* L., a parasite of the cabbage worm, was sent to the United States from England in 1883 and likewise proved successful.

Nevertheless, these efforts were scattered over ten years, and the true beginning of the sustained biological control movement did not come until 1888 and 1889, when Albert Koebele traveled to Australia for the U. S. Department of Agriculture to secure natural enemies of the cottony cushion scale. At this time, this pest was killing so many large branches of citrus trees in California that the industry was threatened with extinction. Banks refused to accept infested groves as collateral for loans.

Albert Koebele shipped back some Australian ladybirds (*genus Rodolia*), which readily killed cot-

tony cushion scale and thrived over the winter in the groves. Propagating, they quickly reached adequate numbers to check the pest, and to this day their descendants—together with those propagated in the insectaries and released—have kept the scale under control. All told, the introduction of this insect probably did not cost the government more than \$5000 including the salaries of the scientists.

For 25 years, Koebele, the first of the entomological explorers, was engaged in importing parasites. He worked for the U. S. Department of Agriculture, then for the California State Board of Horticulture, and finally for the Hawaii Board of Agriculture and Forestry.

Contemporary with him was George Compere of the California Board of Horticulture, who from 1899 to 1901 traveled to the Far East and Australia in search of scale insect parasites and predators. Following this, from 1901 to 1904 he served the Government of West Australia in finding and importing parasites of fruit flies. So valuable were his services that from 1904 to 1910, California and Australia employed him jointly. His quests for insects beneficial to crops took him around the world.

Both Koebele and Compere were self-trained naturalists. Not so Frederick Muir, the remaining pioneer, who had a hand in setting biological control on a firm footing. Technically trained, he began exploratory work in 1905 for the Hawaiian Sugar Planters' Experiment Station. He was especially eager to find shock troops that would attack the sugar-cane beetle borer, *Rhabdoscelus obscurus*. Tracing down this and that clue, he found at long last at Amboina, in the South Sea Islands, the insect *Macroceromasia sphenophori*. This, he had reason to believe, would curtail the pest, and after prolonged effort, he was able to transport it alive to Hawaii, where it met with great success in the purpose intended.

In turn, those who have followed Muir have been specialists, devot-



▲ INSECTICIDES would sometimes only interfere with the use of beneficial insects against harmful insects. The tree at right shows the damage from red scale insects on a lemon tree on which the beneficial insects

ing themselves quite closely to specific problems. For instance, in California, the Citrus Experiment Station took a special interest in a shipment in 1927 of two parasites (*Tetraneura pretiosus* and *Coccophagus gurneyi*) from Australia for the control of the citrophilus mealy bug. Already, it had spread to 70,000 acres of Valencia oranges.

Ordinarily, the Valencia hangs onto the trees during the summer months. This makes it possible for the consumer to have oranges the year round. And being available in the fall, the Valencia does not have to compete with the navel orange or with the main Florida and Texas crops. The mealy bug, however, caused these oranges to fall off. To prevent their falling, the grower was forced to pick his fruit early and sell it in competition with other varieties, which greatly reduced his returns.

By 1930, the imported parasites had put this pest out of the picture as an economic factor. They have probably saved citrus growers more than \$1,000,000 a year. Yet the total cost to the University of California for the search, importation, and establishment of the beneficial parasites did not exceed \$10,000.



Photograph courtesy University of California

ad been eliminated by spray. The tree at left has remained healthy, because the chalcid fly has been able to control the scale by itself

In the introduction of natural allies from abroad, great care is exercised to avoid releasing any imported species that might possibly prove detrimental. As Dr. Stanley E. Flanders of the University of California puts it, "We make sure that the parasite or predator has the fixed habit of attacking the pest for which it is employed and that it cannot become a problem in some other way. Imported insects, whether noxious or beneficial, are apt to run rampant when introduced into a favorable environment."

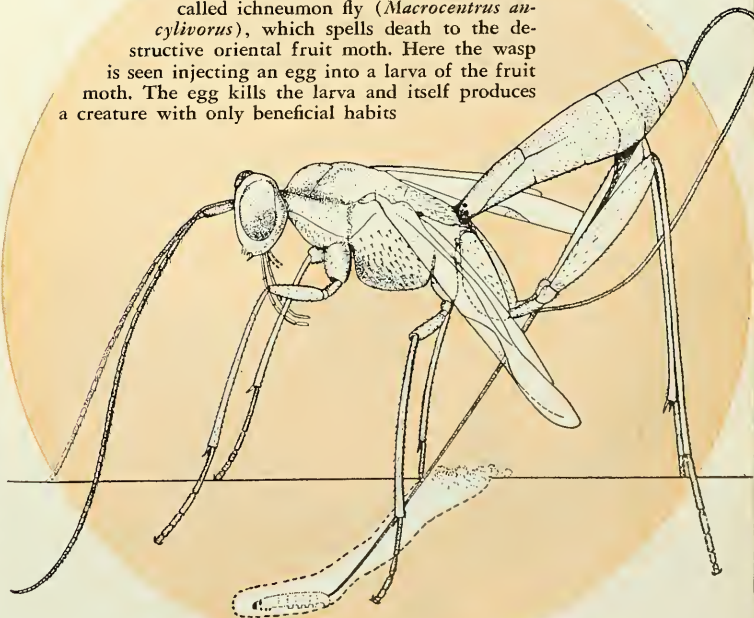
"It is significant," Dr. Flanders continues, "that most of our serious agricultural pests have been 'stow-aways'—insects that secretly entered the country from abroad. In the new environment these insects thrived unfettered by natural enemies. If one or more insects already present do not attack the new pest and effectively control it, we are obliged to search the world for natural enemies that will do so. Such natural enemies of the pest are most apt to occur in its native home. But if they are valuable as control agents, they are apt to be scarce. Their effectiveness will have reduced the insect they kill, and their own numbers

Continued on page 144



▲ A TEST to evaluate the effectiveness of beneficial insects. The lefthand branch, being enclosed, will not have the benefit of the insect clean-up squad. It has, however, been given a treatment of DDT. The righthand branch, being left open at both ends, can receive the pest-destroying insect. Careful comparisons of this sort are necessary in each instance, because sprays are still extremely valuable

▼ THE WASP that won a war: the so-called ichneumon fly (*Macrocentrus ancylovorus*), which spells death to the destructive oriental fruit moth. Here the wasp is seen injecting an egg into a larva of the fruit moth. The egg kills the larva and itself produces a creature with only beneficial habits





▲ THE AUTHOR examines his Mako family. One of the few times a Mako ready to give birth has been reported

I WAS fishing one February afternoon just off Cat Cay in the Bahamas when we had a strike on one of our trolled baits, and the fish at once cleared the water in a fifteen-foot leap, showing that we had a very large mako shark. I fought the fish for twenty minutes. It made three runs, surfaced three times, but did not jump again. We finally brought the shark alongside and attached a bronze cable to its tail so that we could tow it to the dock. When we weighed it there, it was 504 pounds. A very great surprise was in store for us.

We hung the fish up all night and the next morning put it on the dock and opened its abdomen. There we found ten perfectly formed small makos. Each of the "pups" weighed two and a half pounds, and they were apparently on the verge of birth. "No wonder she took the bait," said someone, "she was eating for eleven!"

This, I am told, is one of the few times that a mako ready to give birth has been reported. Perhaps it is the only time an angler has ever taken eleven fish on a single hook!

The discovery revived an old fisherman's tale that the female mako acts like a "mother ship," letting her young swim in and out of her body at will. This may sound plausible if you haven't boned up on sharks or if you've got your sharks mixed up with kangaroos. But the information contained in a

Mother Mako

Perhaps the only time an angler ever took eleven fish on a single hook—and gained a few facts of life in the bargain

By JOHN M. OLIN

Trustee, the American Museum of Natural History

letter I received from Mr. William C. Schroeder of the Woods Hole Oceanographic Institution should settle any arguments on that point. "As for the story that the mother mako protects her young," wrote Mr. Schroeder, "we have no indication that any species of shark protects its new-born, even for a brief time. The young are apparently on their own from the time they are born, and they may be lucky if they aren't devoured by their own mother. The mother could not possibly release them at will or bring them back into her body."

No satisfactory picture of an embryo mako has apparently ever been secured, and I was gratified to be able to provide Mr. Schroeder and Dr. Bigelow with one of the pups for study at Woods Hole. The same enthusiastic response came from Dr. Daniel Merriman of the Bingham Oceanographic Laboratory at Yale University. "I am delighted to know that we are going to receive one of the puppies," he wrote, "and all of us look forward to its arrival more than I can say. Your remark that there were ten babies is particularly interesting, because we have little information as to the normal number in a mako litter. The relatively large size of the young at birth had led to the assumption that the number in any one brood must be small."

I had mentioned to Dr. Merri-man that none of the unborn makos seemed to have an umbilical cord—nature's usual breadline between mother and unborn young. He therefore favored us with the following information about reproduction in sharks.

"There are three different types of embryonic development in sharks, depending upon the species:

"(1) In one type, the shark lays eggs that hatch outside the body. A shell is formed around the developing egg, and the egg is laid at an early stage in the growth of the embryo. Hatching occurs considerably later and in much the manner in which a chick hatches from its egg, but of course under water. Sharks that produce their young in this fashion are called oviparous—in other words, they are 'brought forth from an egg.'

"(2) Some sharks give birth to living young. Here the developing embryo comes to have an attachment to the wall of the uterus, a connection comparable to, although not exactly like, the placental arrangement in humans. Sharks that reproduce in this fashion are said to be viviparous ('born alive').

"(3) The remainder are produced as were your makos. They hatch from an egg while it is still in the body and undergo further develop-

ment in the oviduct before being born as miniature adults. The embryonic shark in this case is nourished by a yolk sac attached to it and also from the nutritive fluid in which it is immersed. Your young makos never had a placental attachment to the mother, and they lay free in the oviduct or uterus. After the yolk was absorbed, it is possible that they nourished themselves by swallowing the unfertilized eggs that lay close to them in the genital tract. Sharks that produce their young in this fashion are called ovoviviparous, that is, they hatch from an egg but undergo further development inside the mother before being born alive."

It is believed that the young of the mako have very large yolk sacs and that the connection between the developing shark and its nourishment disappears fairly early, which is not the case with most sharks. One of the miniature makos was received as a welcome addition to the American Museum's notable world collection of fishes.

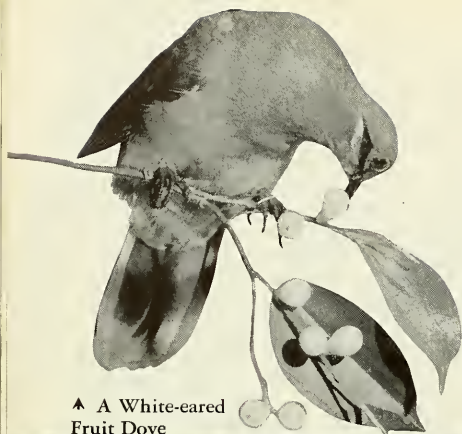
Our mako may have been a young mother, because makos are known to attain a length of about 12 feet and a weight of slightly over 1000 pounds. The mako is typically a near-surface fish and is often seen swimming on sunny days with the tips of the first dorsal and caudal fins breaking the water. It ranges the tropical and warm-temperate Atlantic both north and south of the equator and is known to have been caught off the Cape of Good Hope. It is at home in the eastern Atlantic and also in the Mediterranean.

Despite rumors to that effect, the mako is not a garbage man but a fish-eater. It also is known to attack man on occasion. Give it a wide berth; it is not a safe swimming companion. It consumes large quantities of small fishes, especially of the mackerel and herring tribes, and much larger ones as well. In one instance, the stomach of a 730-pound mako was found to contain a 120-pound swordfish nearly intact, with the sword still attached.

▼ WITH DENTAL EQUIPMENT like this, the Mako makes a poor swimming companion. The author and Capt. Douglas Osborn

Carl J. Schmid photos





▲ A White-eared
Fruit Dove

Pacific Bird Life in The W

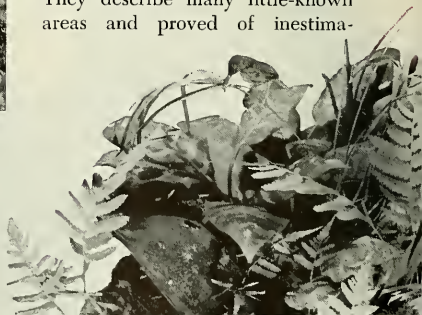


▲ LOOKING toward historic Corregidor from the mountains of Bataan Peninsula, where two fierce military campaigns were fought. Nature has now healed most of the scars. Of the 100-odd species of Bataan, 47 different species of birds are shown in this group. At right, the famous Tailor Bird perches above a rusting helmet

THE idea of a Pacific Hall of Birds in the American Museum originated even before the end of World War I. Toward this end there was launched one of the most extensive series of explorations in the history of bird science. Hundreds of individuals took part in the effort to round out the scientific knowledge of the birds of the Pacific area, a realm embracing nearly half the surface of the globe and virtually every variety of climate and topography.

Meanwhile, in 1929, plans were laid for a large new building for what was becoming the world's largest collection of birds. In that year the late Harry Payne Whitney gave \$750,000 toward this, and the City of New York added an equal amount. Whitney Wing is the result.

The field diaries of the many expeditions form a substantial saga in the history of exploration and have become part of the treasured archives of the Museum. Dr. Robert Cushman Murphy, who directed the program for three decades, edited the original field journals to fill 26 typewritten volumes. They describe many little-known areas and proved of inestima-



More than 1000 islands were explored in a 24-year program to procure the specimens and scientific knowledge for this newly completed public exhibit

Whitney Memorial Hall

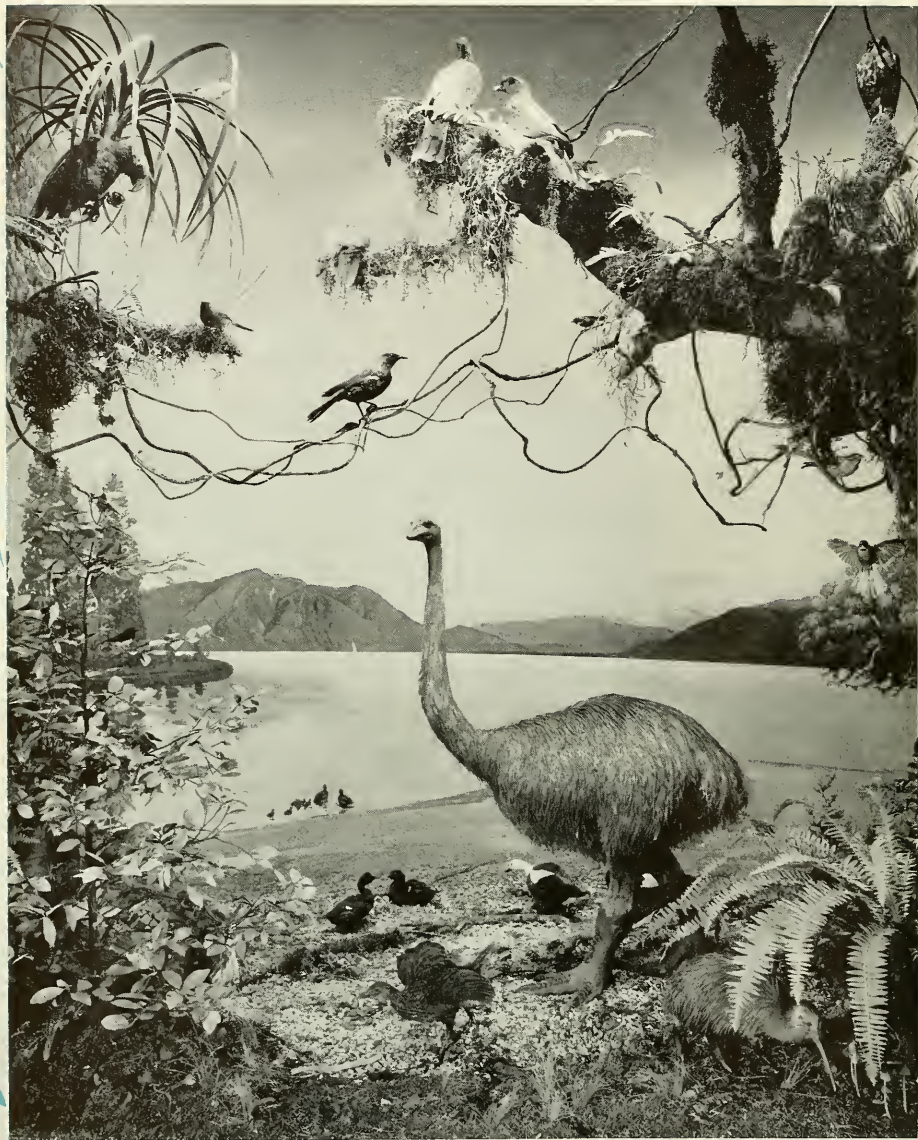
ble value to our armed forces during World War II.

Three generations of the Whitney family have given their support to this great building, its collections, and exhibits. *NATURAL HISTORY Magazine* has already shown a

number of the exhibits completed earlier. The four depicted on these pages round out the total of 22. Whitney Memorial Hall is now open to the public, and it is acknowledged to be the world's finest display of the birds of the Pacific.

▼ PAPUA: just beyond Kokoda "Track," where allied forces turned the tide of onslaught. Birds of paradise, crowned pigeons, and bower birds liven the landscape here. Center and upper right the Greater Bird of Paradise





▲ THE PLACE: Lake Brunner, in the South Island Alps, New Zealand. The time: over 500 years ago, when the huge moa was still alive. In right foreground, the Kiwi. At upper left, the Kaka, or forest parrot. A pair of New Zealand pigeons perch at top center. The lower picture shows the Kakapo



▲ THE LANDING COVE on the main island of the Snares, south of New Zealand. The conspicuous Snares Crested Penguins, shown below, are nursing and feeding their young. Overhead is a skyful of sooty shearwaters. This scene, like all the others in Whitney Hall, is an exact replica of an actual spot





Nell Murbarger photo

▲ FOR TWO MILES along the wall of Frijoles Canyon, cave rooms and cliff-pockets like these were cut by the ancient people in the volcanic rock. Many second-story rooms were made like the one seen at upper right

City of the Cavemen

A metropolis of man-made grottoes tells a dramatic tale of ancient life and strife in New Mexico

By NELL MURBARGER

AS the winding saddle trail to Yapashi ruin in New Mexico nears the rim of Frijoles Canyon, there is a point where a man can halt his horse, turn in his saddle, and look down upon one of the greatest sights known to the world of archaeology.

Through a green carpet of box elders, hundreds of feet below, you see a rivulet winding through the Canyon of the Beans. On the farther shore of the stream slumbers the great ruin of Tyuonyi pueblo; and immediately beyond rises the sheer north wall of the canyon. From this high vantage point on the south rim, it is possible to scan the base of that opposite wall for a span of nearly two miles, and in all that distance there is scarcely a rod of space that fails to show the presence of small pockets excavated by man from the volcanic tuff of the cliffside.

Armed only with crude stone chisels and picks, the ancient people of Frijoles Canyon created here the world's largest city of man-made caves. It is now embraced in Bandelier National Monument. No one knows when this Canyon of the Frijoles was first occupied

by man. Archaeologists generally assume that it was around A. D. 1000 or 1100, with the main influx of population about A. D. 1300. When man came may remain forever a mystery; *why* he came should be apparent to anyone.

In a land otherwise largely arid, here was a sheltered gorge, well wooded and blessed by an unailing stream, with fertile land along the creek—an important advantage to people who relied upon winter stores of corn, beans, and squash. The canyon further abounded in wild game and wild fruit, while its sheer walls were completely defensible against the raiding Plains Indians and the nomadic Navajos. To harried wanderers seeking a home, it must have seemed a true Paradise!

Once they had arrived in the canyon, the initial concern of these first settlers was for food. Second only to this was their need of shelter. In a land lying at 7000 feet above sea level, the threat of ap-

proaching winter never strays far from the skyline.

How fortunate, then, that the rock of these canyon walls was composed of the finer kinds of volcanic detritus and was thus sufficiently soft that it might be worked with stone tools! Few of the cave rooms that the settlers hacked from the cliffside were more than eight feet in diameter. But with an animal skin draped across the low, narrow door opening, and a fire burning on the stone hearth, here was a place where a man might sit with his family—a place where neither wind nor rain nor snow might enter.

In the course of possibly 100 years, the ancient people of Frijoles Canyon hewed from the rock wall more than 300 such homes. Some were limited to a single cramped room; others embraced two or three rooms connected by tiny doorways.

How many years or generations may have elapsed before some ingenious "caveman" had the happy

George A. Grant photo, U.S. Dept. of the Int.



▲ A GOOD ROAD, visible in the distance, leads to Frijoles Canyon, and easy trails take the visitor to the most interesting points

◀ ONE OF THE DWELLINGS along the south wall of Frijoles Canyon, in Bandelier National Monument



George A. Grant photo

thought to enlarge his dwelling by building an outdoor annex of stone and mud is beyond knowing. But the annexes came, extending out from the doorways of the caves, with roofs supported by poles. One end of each roof timber was socketed in the cliff wall, and the roofs were thatched with brush and mud.

Using these earthen roofs as their foundation, some of the people hacked out "upper story" caves in the cliff and above the annexes as well. This village eventually followed the base of the cliff for two miles. Through much of its length it stood two and three stories in height, and in some sections it extended out from the cliff for three and four rows of rooms.

Came another lapse of time, and once again a major architectural change was taking place in the canyon. Midway between the cliff and the stream, a new pueblo was in course of construction. Never in its prehistory was Frijoles to

know a higher type of architecture than that represented in this great communal dwelling of Tyuonyi, whose name means "meeting place" or "place of council."

Well-equipped moderns, accustomed for centuries to the convenience of metal tools, wheeled vehicles, and beasts of burden, marvel at the stupendous work involved in the erection of this building by Stone Age artisans. Before the first footings could be laid, it was necessary to clear and level the land—rough, rocky land, with large trees to be felled and dense brush to be removed. All this without a horse or an ox.

Formidable as it was, the task of preparing the site was a minor consideration compared to the construction of a building comprising possibly 500 rooms, with 300 of them on the ground floor! For reasons of security, the outside wall of this great circular building rose smooth and straight without window or door to afford access to

enemy hordes. The only point at which the pueblo might be entered was by way of a narrow corridor cut through the easterly tier of rooms.

Pottery and other materials recovered from the ruins tell archaeologists that Frijoles Canyon probably experienced its greatest period of occupation in the fifteenth century. If all homes in the canyon had been occupied to capacity, 4000 persons could have been accommodated. But natural water supply and available farming land seem inadequate to support any such number, and it is supposed that the dwellings were never filled to capacity or all occupied at any one time.

And, finally, the canyon was abandoned altogether. When? Why? The latest of the existing tree-ring dates for Tyuonyi is 1505. From this, we can assume that there probably was little construction after that time, and the people probably abandoned the place



▼ THIS is the top of the kiva, or ceremonial chamber, located in the north wall of Frijoles Canyon

▼ MORE THAN 300 HOMES were hewn in the rock wall, but it seems unlikely there was enough water for the full capacity of about 4000 persons at one time. Adolph Bandelier lived in this ancient dwelling during his researches in the canyon years ago

George A. Grant photo, U.S. Dept. of the Int.

George A. Grant photo, U.S. Dept. of the Int.





George A. Grant photo, U.S. Dept. of the Int.

▲ **EVEN THOUGH** the stone is relatively soft, one marvels at the diligence shown by the ancient inhabitants, cutting these chambers with only the simplest of tools

▼ **A FAVORITE PASTIME** in Bandelier National Monument is exploring its back trails on horseback. This is the Lower Falls of Frijoles Creek on the lower trail

National Park Service photo



sometime during the sixteenth century. As to why they left, there is no really good evidence, although several theories have been advanced. Residents of the present pueblo of Cochiti, who claim to be descendants of these ancient cave-men, have a legend that their forefathers were driven from the place by invading forces of "little strong men."

Abandonment may have come as a result of such persecution or through natural causes, such as recurrent droughts or gradual exhaustion of the soil. We can only say that the canyon was one day forsaken by a people who had made it their home for more than

twice as many years as the Government of the United States has existed.

Climbing the ancient paths cut in the soft rock of the south wall, the people finally made the last long climb to the mesa. On their backs they bore their babies and cooking pots and baskets, their animal skins and seed, their bows and arrows and stone axes and hoes. It is easy to imagine them, as they neared the end of the long ascent, pausing on the trail for one last look back at the high stone walls of beautiful Tyuonyi, that laboriously-built city they were leaving forever. One final look—then over the lip of the gorge and

out across the expansive mesa.

Ten miles by trail took them to the site where their new pueblo was to rise.

Whatever their reason for deserting the canyon, they must have considered the action unavoidable. Otherwise, they would not have exchanged that pleasant haven for the insecurity of a high plateau where winter's blizzards lashed the land with added fury and where the closest water—the nearest potential farming land—lay a mile away. Here, with all the forces of nature pitted against them, these displaced refugees began laying the footings for their new pueblo of Yapashi, a place that would



▼ HERE ONE LOOKS down upon the great circular pueblo of Tyuonyi on the canyon bottom in Bandelier National Monument

Nell Marbarger photo



eventually rival the glory of lost Tyuonyi—and eventually would suffer the same abandonment.

My acquaintance with the pueblos and caves of Frijoles Canyon was well established long before it became my privilege to visit that second great ruin on the plateau and its Shrine of the Stone Lions, famed to archaeologists as the only life-sized stone effigies of animals in the Southwest.

It was early in the morning when my companion and I set out for the Shrine from our camp in the box elders, but even our strong, willing horses found it a hard trail, and the sun had passed its zenith before we reached our goal.

More than three centuries of buffeting by wind and weather have left these great stone "idols" rather tattered and formless; but even though physically disappointing, in the light of archaeological significance they have no equal in the United States.

Behind the creation of this unique Shrine lies spirit worship as old as man's history. Among Pueblo Indians of the Southwest, every hunter going forth on the trail of wild game carries with him a small talisman carved in the form of some animal noted for its stamina and courage. Placing the mouth of his hunting fetish to his own lips, the hunter believes that he is able to draw into himself the strength and cunning of the beast represented.

These ancient dwellers of Yapashi may have reasoned that if the power of a small fetish was so great, what truly miraculous results might not be obtained from a life-sized image? And in carving the image from the solid rock of the mountain, what could be more fitting than that it should take the form of the Pueblos' most revered animal, the cougar, or mountain lion?

When originally discovered to archaeology and literature by Adolph F. A. Bandelier and Charles Fletcher Lummis in 1890, each of the two lions comprising the shrine measured sixteen inches in height

at the shoulder, two feet wide at the base, and six feet in length.

Describing his and Bandelier's discovery of the strange shrine, Lummis wrote: "The figures are life size and even the erosion of so many centuries has not gnawed them out of recognition. The heads are nearly indistinguishable, and the foreshoulders have suffered; but the rest of the sculpture, to the very tips of the outstretched tails, is perfectly clear." Today, alas, the elements have rendered them unrecognizable.

"Worshipped continually for longer ages than Saxon history can call its own, they are worshipped still," wrote Lummis in 1897. "No important hunt would even now be undertaken by the trustful folk of Cochiti without first repairing to the stone pumas, to anoint their solid heads with face paint and sacred meal, and to breathe their breath of power."*

More than half a century has slipped by since these words were penned by the great Southwestern historian. Meanwhile, the world of the white man has gone modern, old customs have been discarded, and superstitions cast out. But to Puebloland, 50 years is as nothing. People of San Felipe and Cochiti pueblos still hold their communal hunts; and prior to each hunt, they still trudge across the mesas to the Shrine of the Stone Lions, there to sprinkle the sacred meal and spread paint upon the tattered forms of their forest fetishes.

Leaving the shrine, we rode on down the trail to Yapashi—forlorn, impossible city on the mountain-top!

Still armed only with stone axes and obsidian "saws," workmen had shaped the volcanic tufa into rectangular blocks—thousands upon thousands of them—and with these had erected a great communal dwelling containing an estimated 400 rooms. Unlike Tyuonyi, the pueblo of Yapashi had not been circular but was laid in the form of a three-sided box, with all its

rooms opening upon the central courtyard.

Today we find Yapashi a fallen city with no wall standing higher than a single story, and few more than five feet above the ground. Still, however, the foundations can be traced for hundreds of feet through the heavy overgrowth of cacti. The form of the individual rooms can be determined and their dimensions measured. Centering the courtyard are three circular ceremonial chambers, or kivas; and strewn everywhere upon the sandy surface of the ground lie black obsidian flakings and endless fragments of broken pottery. No excavator's spade has ever disturbed the sleep of Yapashi, and what archaeological treasures may lie in her crumbled ruins is any man's guess.

As we rode back along the looping trail toward camp, I found myself thinking of all the things I would like to know about Yapashi. When had the tufa blocks in those rugged walls been shaped and laid? For how many years, or generations, had this town on the mountain known the happy shouts of children at play, the fragrance of juniper wood burning on stone hearths, and the pride of menfolk returned from the hunt? And how many moons had looked down on the ghostliness of cold, empty rooms and the desolation of three old kivas in the silent courtyard?

The last flaming fingers of sunset faded from the sky. Twilight settled upon the mesa, and the canyons became dark. It would be very late before we would get back to our camp on the little river of the Frijoles; but neither my companion nor I, nor our tired mounts, had any desire to make haste.

On city streets, where every lost second is a minor tragedy, a man may hurry—if he chooses. But not where forgotten Yapashi and a pair of ageless stone lions are at one's back, and other adventures into the ancient Southwest lie ahead.

In a land where time is measured only by centuries, there is no place for the impatient foot.

* *Land of Poco Tiempo*, 1897.

On Location in the Amazon

Motion picture problems among a group of Brazilian Indians who scarcely knew the white man required patience, understanding, and originality

By ZYGMUNT SULISTROWSKI

PEOPLE often asked how I was able to take the native scenes in the film my wife and I recently made in the Brazilian jungle, and I must admit that the problems we encountered were quite different from what one would ordinarily expect on location. For example, we could hardly have anticipated that one of the men of the primitive Indian village would want to marry our

heroine Marilia, a beautiful actress from more civilized parts of Brazil.

The plan to make a semidocumentary color film in the Brazilian jungle had long been taking form in my mind. I had studied for two years at the Institute des Hautes Etudes Cinematographiques in Paris. Later I worked for one year for the J. Arthur Rank organization of England. After six months of preparation in Brazil, including an

extensive exploratory trip into the interior to find the best locations, our party of nine set forth on a 2000-mile trip into the Matto Grosso jungle.

Our plane put us down in a clearing at the native village of Jacare, which is as far into the interior as a plane could land in the region of the Xingu and Culuene Rivers. Here we were 400 miles from the nearest civilized settlement. We had scarcely time to take our pictures in the seven weeks that remained before the rainy season would turn our landing field into mud so deep that no plane could hope to take off. Nevertheless, we spent the first four or five days accustoming the Camayura Indians to ourselves and our equipment.

We had come in a DC3 with

◀ THE SMALL PLANE in which the author made his reconnaissance has just landed close to a village of Calapalo Indians on the Culuene River. The bearded gentleman under the wing is Father Cavalcini, a well-known missionary, who joined the author on this flight



➤ A GROUP of Camayuras, wondering what magic the white man is performing with that black box on three legs

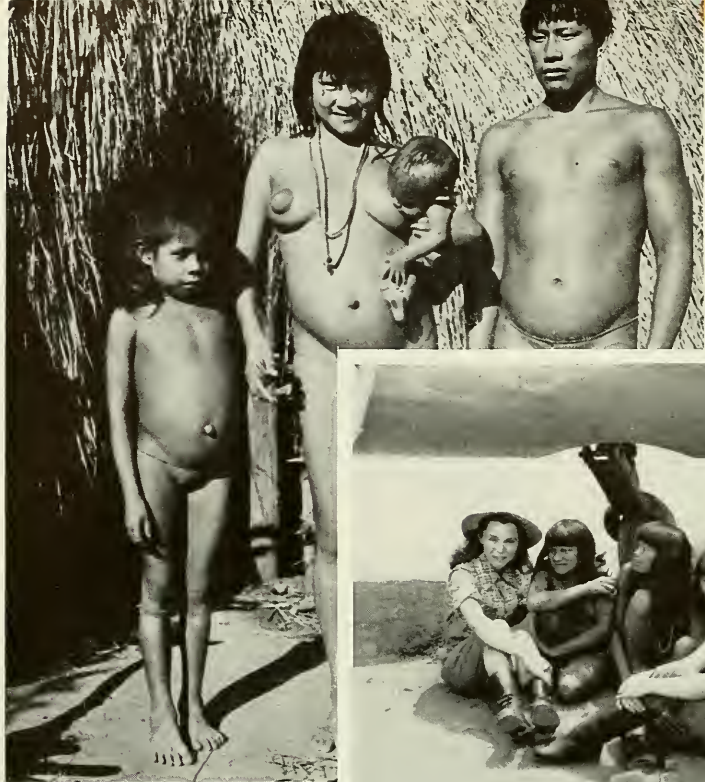
▼ ONE of the most dangerous fighters of the Camayura Indians



CAMAYURAS with boat and bow used in fishing



▲ AMONG the Camayuras, the bow and arrow is the most important weapon in hunting, fishing, and protecting the family



◀ THE PRETTY MAYALU and her husband, Mayupi, with their two children: a fine example of the Camayura family

▼ THE FIRST TWO WHITE WOMEN to live in this region: Mrs. Monique Sulistrowski, the author's wife, and the actress Marilia (Miss Andrea Bayard)



approximately 3000 pounds of equipment, food, medicines, and gifts for the Indians. It had not been easy to get permission for this, and we were extremely fortunate to have the assistance of the only white man in the region, Leonardo Vilas Boas, one of three famous brothers all living among various tribes in the interior. His reputation among the Indians is really remarkable. Indeed, after we had left the village, he was moved to another locality, and we heard that trouble had broken out almost at once. The people in the village that we had come to think of as our home killed two people, and no camera work could possibly have been done. We could never have succeeded without our go-between.

The first signs of the difficulties we were to encounter came when we recorded some native songs on the tape recorder we had brought along. The recorder was powered by two automobile storage bat-

teries, which had to be charged every three or four hours with a gasoline generator we had brought. When we played back the first singing of the natives, they were terrified and ran away. They stayed in the distance for about 20 minutes and then slowly approached with obvious caution. I'll admit that we played the instrument rather strongly at the start, and perhaps they feared so magnified a version of their own voices.

You can imagine that they did not like the gasoline generator. They had of course heard the motor of an airplane, but this engine seemed to make much more noise for its size and at close range was terrible. In time, however, they got more or less used to it, and in the end we were charging our batteries every third night just to make sure they were full. We had brought approximately 60 gallons of gasoline to run this machine.

Our efforts were rewarded by securing some six half-hour tapes of native voices and about the same amount of forest sounds.

This was the first time that white women had ever stayed for any length of time in this part of the country. My wife was with me, and we had one actress for the motion picture, which portrayed the travels of white people in this remote part of Brazil and depicted the sort of native life they would witness if they were thrown by accident into one of these villages. About 20 minutes of the film is devoted to natural activities of the village as seen through the eyes of the stranded white people. I may say that it was extremely difficult in the seven weeks we spent here to secure enough co-ordinated activity from the Indians to provide the sequences we wanted, but we finally got what was necessary.



◀ **TYPICAL MORNING OCCUPATIONS.** The man is preparing to paint himself with the juice of native plants, while his wife is making string and the two daughters are trying to dispose of undesirable guests

▼ **MAKING necklaces** is one of the very important occupations. The Indians not only use them for personal decoration but as a unit of exchange. One long necklace is equal to a dugout canoe. Drilling the holes requires endless patience

From our point of view, these people show a minimum of discipline. Chieftainship with them seemed to be a purely nominal matter, and we had difficulty in determining any directional authority in the village. The people seemed to change activities repeatedly without much plan. Even so small an interruption as changing the film in a camera would cause them to depart to some other task. I was photographing their fishing by bow and arrow from dugout canoes when a shower of rain interrupted everything momentarily. It was a long time before I could get the same combination of people in a sufficiently similar situation to complete the scene.

Before we had left Rio, we had been warned by people in official positions that an undertaking like ours was a problematical one. They told us that the Indians might prove quite distrustful and that we would be risking valuable equip-



ment. This danger, I should say, never materialized, though we found the natives all too ready to share our food supplies, and we passed the last two weeks living

on the wild ducks and fish we could catch.

We were among a people who wore no clothes and depended upon a hand-drill to generate fire.



▲ A NECKLACE of jaguar claws adorns this dancer dressed for a ritual dance that cannot be seen by any woman. It is usually celebrated in a closed hut



▲ A SCENE from the motion picture, in which the white people are unexpectedly brought into contact with the Indians

▼ THE AUTHOR with some of the villagers, preparing to enact a war dance. The wrappings on their legs are of string made by twisting a sort of wild cotton. They are to protect the Indians against poisonous snakes as well as for adornment, and the Indians believe they aid the muscles during a long march



Their village of approximately 90 persons was located in the heart of the jungle, in south-central Brazil, and so far as I could see there were no paths through the dense forest. The people were extremely agile, however, in penetrating it. I recall once that I shot a duck from the dugout, and it fell into what looked like an impenetrable thicket. One of the youngsters in the boat dove into the water and was ashore like a dog, ferreting his way through the growth to the exact spot where the fallen duck lay hidden. He returned with it in no time.

These people made a poor variety of pottery, in which they cooked food, and their chief cutting instrument was a wooden handle containing the teeth of the most vicious fresh-water fish known—the notorious piranha. The teeth of these fish were so sharp that it was possible to cut one's hair with them and to shape pieces of wood nicely. They even used the piranha teeth in making dugout canoes.

Metal knives were almost unknown to these people, and one of the most interesting experiences occurred in this connection. It was necessary, in order to induce the natives to act for the camera, to offer them gifts, and knives were obviously especially desirable. On seeing the metal knife, the Indian would reach for it and immediately scratch the back of his hand until the blood came. Then a look of great joy would come over him, and, licking the scratch clean, he was ready to do business for the knife.

They knew guns but had none. One might expect that a motion picture camera held to the eye and aimed might be supposed by them to be a form of gun. But strangely enough, they did not draw this conclusion.

The thing I noticed was that a man and a woman would be attracted by exactly the same gifts. Indeed, a small child or an old patriarch would show exactly the same tastes. I suppose we should not wonder that their common tasks about the village were broken by many interruptions. Life seemed relatively easy. There were no trains to catch, no work schedules, no demands of state or social status. They were afflicted with malaria, but generations of exposure seemed to have made them fairly strong against it; and I do not know of any other diseases they may have had. As is almost always the case with isolated groups, however, white man's infections may in due time make serious inroads unless very special precautions are taken. Their village was like an Eden but, I fear, an Eden whose days are numbered, for civilization seems to end all such settings.

The men were extremely anxious to procure cloth shirts like ours, and I had brought some. This desire was boundless. For the moment, nothing was so important as to possess one of these shirts, possibly for the protection it would give against the mosquitoes. For some work along the river, I gave one of the shirts to Kalapo. He

was delighted. Then he took it off to go in the water, and when he came out, he rolled it up and walked home. The next day he tore it a bit on the branches, and after that it was of no interest to him whatever.

They are marvelous swimmers. Other natives, like the Chavantes, for instance, who make their living chiefly by hunting, often cannot swim at all and are limited in their activities to one side of a river, unless they have a boat. This keeps the various tribes apart to some extent. But our fisherfolk were not bounded by any such limitations, boat or no boat. All the people in the village swam with remarkable skill. They could hold their breath a very long time and swam under water with proficiency.

Of course their skill in swimming was of value in connection with fishing with the bow and arrow. This was done mostly from the bow of a boat, rarely from a tree overhanging the water. When the fish was shot—and some of them were extremely heavy creatures about three feet long known as *piraras*—the bowman would leap into the water and pursue it. The second man in the boat was sometimes of help in bringing the fish on board, with the arrow still in its body.

I suppose it was because I could not easily fit my mind into their scheme, but it often seemed that they had no continuity of thoughts. However, I cannot say that they lacked patience. In order to make a necklace of snail shells, one of them would drill monotonously for most of two or three weeks.

Their natural enemies are jaguars and small snakes. The large snakes they can count fairly well on seeing, but as protection from the small ones they wrap the lower parts of their legs in endless yards of twisted string made out of a sort of wild cotton. Two fairly large jaguars were killed quite near the village while we were there, and these are extremely dangerous animals. But these people are not

really hunters. They live almost entirely by fishing. The balance side of the ledger is further strengthened by the fact that the forest offers them brilliant parrots that can be made into agreeable pets, and these birds frequently enliven the darkness of their grass huts.

We once made a journey to another village. Our camp was at the confluence of the Cululene and Xingu Rivers. We crossed the Cululene and then traveled two days up the Xingu River by dugout and outboard motor. The village we reached had about eight huts, but with about 20 persons in each of them. Five or six natives accompanied us in their own dugouts. The people at the new village held song fests and dances, which we recorded. When we returned to our base camp and played the recordings for our old friends, they were overjoyed. It was as though we had brought them the best present imaginable.

The people of our village never tired of songs and dances. They did much singing after dark, but it was absolutely impossible to use floodlights for any of our pictures. The Indians acted most unnaturally whenever we turned the lights on. But they would often dance around six o'clock in the evening, and though the sun was then setting, we got some interesting pictures.

There were dances to express various moods. Some of them, lively and with bows and arrows in hand, were obviously heroic in spirit. Others slower and more soulful were apparently romantic or spiritual in mood. There were two sorts of songs called *jacui*. One was sung in the attempt to drive an evil spirit out of the village. The other, much softer and more melancholy, was intended to keep a sick man's soul from passing into the Great Beyond. And this last we were to hear in earnest, for during our stay a man in his early thirties fell ill. The singing went on all night. He evidently was afflicted with some pulmonary

infection, and we realized he was close to death. When the singing ceased abruptly and most of the people immediately left the vicinity of the hut, we knew that the end had come. He was buried shortly after dawn, and I wanted to record the funeral. I stood ready with my camera while the grave was being dug, but this was not their wish. They beckoned me away from my camera on the pretext of wanting

me to have conversation with the chief. When I came to my senses and realized that he was engaging me in a meaningless discourse, the burial was almost completed. But they were not angry with me.

I have not mentioned all the special problems of photography in a tropical climate. Let me say that the heat was intense. We had brought a tent but were quite unable to sleep in it and were

happy to move into one of the well ventilated native huts, through whose grass walls the air circulated freshly.

By the time we had finished our work, we had grown to feel real affection for these charming Indians. Marilia, our actress, had her problem of discouraging her suitor, to be sure. But she won in the end without causing embarrassment. She explained that according to the customs of her people, it would not be possible for her to marry without her father's consent, and he was far, far away. Lo and behold, the explanation was quite satisfactory to the gentleman. He understood exactly. So perhaps in certain fundamental matters we are all brothers and sisters under the skin.

The rains began before the scheduled arrival of the plane to take us out, and this worried us a bit. But the weather cleared again and we made the flight back to Rio without incident.

From Rio de Janeiro, after briefly testing and replenishing our equipment, we set out to film the second part of our picture, which involved a five-month expedition to various other regions of the Amazon basin.

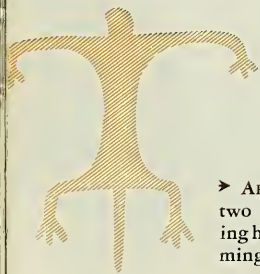
I think I shall see that jungle Eden many times in my dreams.



▲ THE CAMAYURA family depends upon the river for much of their food, and all learn to swim at an early age



➤ ARAPAUA, with her two children, watching her husband swimming



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By **NORMAN FORD**

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▲ SOON this inhabitant of Disney's "Bear Country" will find a hole and turn in for a long winter's sleep

◀ AT HINT OF DANGER the mother bear sends the cubs up a tree



▲ CLARK'S NUTCRACKER has its chance to act in "Bear Country"

▼ MALE BEARS duel for their lady love

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

Bear Country

"**B**EAR COUNTRY" is a film of natural history happenings in the Disney True-Life Adventure series, and, like all of the Disney stories of wildlife in a natural state, it has interest, drama, and continuity," says Dr. Harold E. Anthony, Chairman of The American Museum's Department of Mammalogy. "One sees things as they happen, unrehearsed and uninhibited, and the episodes are details in a sound over-all plan that tells a story.

"As the title suggests, this is a tale of what befalls a bear from the time it rubs the sleep from drowsy winter eyes, strolls off through the snow to meet the warmth of a welcoming spring, through the various vicissitudes of a usually carefree summer, into a comfortable autumn when layers of fat suggest it is time to hunt a hole of sorts and forget the lean and dreary days of winter. Pepys could have had the bear





in mind when he wrote 'and so to bed.' At the showing of this film it is a certainty that only the bear will go to sleep; the audience will not risk missing a foot of the sequence.

"Different individuals come out into the role of star; it may be a single adult bear, it may be a mother bear with cubs, it may be fighting males. The bears may be dead black, they may be cinnamon, they may be something in between. There is a bear to suit most any fancy, and they are continually up to something.

"The setting for the action is the Central Rocky Mountains region, often in the Jackson Hole area. The film includes splendid shots of primitive environment and of some of the bear's associates. Deer, moose, coyote, marmot, and others pass across the stage.

"There is one sequence involving a bird, Clark's Nutcracker, that most certainly is staged and, in the opinion of this reviewer, vulnerable to criticism. The nutcracker catches mice running over the snow in full daylight and speculates upon tackling a pocket gopher, also out on the snow. Only if captive mice and pocket gophers were liberated in front of the camera could such pictures have been secured. Such experiences must be unique both to the nutcracker and to the pocket gopher."

Dr. Robert Cushman Murphy, Chairman of The American Museum's Department of Birds, agrees that this incident was staged by human film directors. "Nevertheless," says Dr. Murphy, "I find that mice appear in the reported natural diet of this bird, so that there is little if any affront to the literal truth."

◀ EXPLORING the "City Beneath the Sea," filmed on dry set

▼ MANY TRAILS meet the divers in this deep-sea adventure story



Writing further, Dr. Murphy says, "Bear Country" seems to me to be a film possessing universal interest and much educational value. I have spent considerable time watching wild bears and their cubs, but this film taught me a great deal that I had not known before.

"High spots in the film are the really top-notch photographic shots of at least six species of mammals and the superb delineation of the play and the climbing abilities of young bears, and also the serious rivalry and combat among adult males during the mating season. Such behavior has perhaps never before been filmed, and it is exceedingly impressive."

"Bear Country" is currently being shown with "Peter Pan."

City Beneath the Sea

LEST anyone in viewing the film "City Beneath the Sea" suppose that it portrays actual underwater exploration in such a city, it should perhaps be pointed out that Universal-International freely admits in their production literature that this is science fiction. This is more than they tell the audience, but it should be added that the producers had a tenuous historical peg on which to hang their drama in the earthquake at Port Royal, Jamaica, in 1692. As for the natural history, so little marine life is visible in the film that our reviewer, James W. Atz, Ass't Curator of the New York Aquarium, comments only briefly.

"Although the divers face spectacular dangers in trying to salvage one million dollars in gold bullion, I was happy to see that they did not encounter either octopuses or giant clams, those traditional underwater nemeses of divers. Fish fanciers and owners of garden fish ponds may enjoy themselves trying to spot the goldfish that somehow slipped into a couple of the underwater scenes."

Brief comments on films previously reviewed

Documentary and Grade A

The Amazing Monsieur Fabre

Life of world-famous naturalist Jean-Henri Fabre

Good insect photography, sometimes erroneously interpreted. Filmed on location in France

Ivory Hunter

One man's struggle to build an African Wildlife Park

Authentic geographically. Marvelous shots of big game. Good conservation

Down the Alphabet

The Big Sky

White traders attempt to open Blackfoot Indian territory, 1832

Blackfoot Indians portrayed with disregard for fact

Hiawatha

A very free interpretation of Longfellow's poem

Good in that it departs from stereotype portrayal of Indian. Not outstanding artistically, dramatically, or scientifically

The Snows of Kilimanjaro

Story of a writer with a complicated personality

Some splendid African animal shots. Camp scenes unconvincing

develops, presumably from what should normally be an axillary bud. Most persons have probably seen two dandelion stems together in a similar form.

Many distortions of this sort are induced artificially in plants when they are treated with various plant hormones such as naphthaleneacetic acid. It is quite possible that we shall see an increase of this sort of thing as a result of wider use of hormones for the control of weeds in lawns, unwanted woody vegetation, etc. Possibly this example came about through wind-drift of such a spray used on near-by lawns.

Not for the Boys

SIRS:

I have just read the article on the San Blas Indian Girl in your January issue. It is very interesting.

I would like to know if the Indian boys go through a similar ceremony.

BRUCE TAYLOR

Stanley, N. Dak.

According to David B. Stout in *Handbook of South American Indians*, the

Cuna boys grow up without having to go through any puberty ceremony.—Ed.

Save-the-Redwoods

SIRS:

The Save-the-Redwoods League wishes to thank you for the prominence given to the movement for saving the Redwoods, in January's issue of *NATURAL HISTORY*, with the article by Weldon F. Heald.

We have heard from many people throughout the United States, and their commendation and support are indeed heartening.

AUBREY DRURY,
Administrative Secretary

Save-the-Redwoods League,
Berkeley, Calif.

Cover Pictures

SIRS:

I wish to take this opportunity to thank you for acquainting me with your fine magazine, *NATURAL HISTORY*, and for giving me the opportunity to become an Associate Member of the American Museum. . . . To date I have received two issues of the magazine and have enjoyed them ever so much. Helen Cruickshank's

color photograph of a scarlet tanager on the December cover is startlingly beautiful. Do you offer a print of this cover design for sale, suitable for framing?

MRS. ALISON CODINGTON

Wallingford, Conn.

The full-color pictures on the cover of *NATURAL HISTORY* Magazine can be ordered from the office of Man and Nature Publications at the American Museum at 5¢ each plus 12¢ postage for each 10 copies or less.—Ed.

From the mother of a boy who received a gift subscription to *NATURAL HISTORY*:

SIRS:

The latest copy of *NATURAL HISTORY* just came, and every time one arrives, I realize what a wonderful and rewarding thing Jeff's Associate Membership in the American Museum of Natural History has been. We read the Magazine from cover to cover and have purchased at very nominal prices some wonderful charts, pictures, booklets, etc. We have been renting slide sets of kodachromes from the Museum occasionally too, and they are really grand. We had one on a volcano in Mexico and another on prehistoric man, which was intensely interesting. We have ordered one on dinosaurs, which ought to arrive tomorrow, and that's Jeff's favorite subject. We have learned a lot and enjoyed it tremendously. . . . I think that if the schools and children's departments of the public libraries down here had any real idea of how much they could benefit from membership, they would all hasten to join up. I simply can't imagine anyone who has to deal with groups of children failing to take advantage of something that asks so little and gives as much as the Museum does.

How to Get Them

Readers desiring information on the American Museum's supplementary publications, lantern slides, and motion pictures may obtain catalogues by writing to: Man and Nature, American Museum of Natural History, Central Park West at 79th St., New York 24, N. Y.

Please specify the type of material desired.—Ed.

SIRS:

The highlight of each month is receiving your exceptionally fine magazine, *NATURAL HISTORY*—the only publication where even the ads are read word for word. One of the touches that help to make the magazine distinctive is the numerous ingenious sketches along the margins pertinent to the article.

We especially look forward to the articles with the magnificent photographs of Joyce Rockwood Muench and Josef Muench. . .

MRS. ROBERT WAITE
East Chatham, N. Y.



of animals that exceeds all others in the number of different species and the group whose habits are often so strange that they exceed rational human imagination, it is only natural that some pests should attack man himself, and many do.

A detailed review of this book would require many pages. The subjects covered are all of interest and often fascinating. We might well end as the book ends: "We have learned something of the way they live, . . . There is much yet to learn and there is far to go: and we shall never reach the end."

C. H. CURRAN

I DRANK THE ZAMBEZI

----- by Arthur Loveridge

Harper & Brothers, \$4.00
296 pp., 30 illus., map

EASTERN Africa is scored by giant rift valleys, in which lie many large lakes. Well to the south of the equator, Lake Nyasa gives its name to Nyasaland, composed of lands on its western and southern sides. After years of study in East Africa, Arthur Loveridge planned a herpetological survey of Nyasaland and of a region on the middle Zambezi River.

The book is the journal of a zoologist during nine months of enthusiastic collecting. Besides the cold-blooded vertebrates, Loveridge gathers mammals, birds, snails, even ethnological oddments, all for the museums at Harvard University. Stories he collects too, which he relates with exceptional precision. When he gets a giant chameleon that eats birds, you learn its exact length and scientific name. If a snake dashes for refuge, he knows its identity and just how to handle it. For every lizard or frog there are items of interest and a rating of rarity. The story of a policeman attacked by a bullfrog receives approval; but the giant cobra with comb and wattles, crowing a warning, is sadly deflated.

For six months Loveridge, his wife, and a sister-in-law toured the highlands from Mlanje north to the Misuku Mountains. He had planned to profit by the early rains, so favorable for his studies. But in 1948 the rains were sadly deficient in the lowlands. They did come to the mountains, and there everyone

shivered. In this part of Africa the montane forests have been reduced to small areas, and soil erosion is a menace.

Some weeks on the banks of the Zambezi produced most of the creatures discovered there a century earlier by Wilhelm Peters. The muddy river held the only drinking water, and thus provided the title of the book. Harvard's museum was enriched by thousands of specimens; to the known fauna of Nyasaland 46 species were added. This record of expert investigation is spiced with observations on the progress of Africa, the ways of its peoples, and problems awaiting solution. It makes a book to be prized by naturalists, who can learn so much from it.

JAMES P. CHAPIN

FRESHWATER TROPICAL AQUARIUM FISHES—AN ENCYCLOPAEDIC SURVEY

-- by G. F. Hervey and Jack Hems

Batchworth Press, London (British Book
Centre, New York) \$8.50, 425 pp.,
32 plates (8 in color), 87 figs.

THE hobby of keeping small freshwater fishes as pets is a century old, and it has had its ups and downs, but it has never enjoyed anywhere nearly the popularity that it does at present; in fact, the fancy now seems to be expanding at a fantastic rate. One indication of this explosive growth is the number of new books on the subject that have appeared within the last few years.

This book is the most ambitious one on tropical fishes and home aquariums that has ever been attempted in English, and it has exceeded in scope only by a couple of German compendiums. Besides treating such general subjects as the setting up of an aquarium, the care of aquatic plants and the feeding, breeding, and treatment of fishes, both in sickness and in health, Messrs. Hervey and Hems have described some 450 different species of tropical fishes in a Catalogue that comprises almost two thirds of the volume. That they have failed to do a completely satisfactory job is partly a measure of the magnitude of the task they laid out for themselves.

The general information the authors give is reliable and is presented in a

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clear and well-organized fashion. Even allowing for the notorious variability of living plants and animals, including the aquarist himself—which variability is largely responsible for relegating aquarium-keeping to the realm of the arts and not the sciences—the reader should seldom go wrong in his attempts to follow the principles and practices described. Too many errors, however, have been allowed to creep into the text. Although these misstatements of fact will rarely discommode the reader, they mar what might otherwise have been an authoritative reference. Most unfortunately, the drawings illustrating the fishes leave much to be desired and in a few instances are completely unsatisfactory.

JAMES W. ATZ

THE FULMAR

----- by James Fisher

Collins, London, 35 S, 496 pp., 48 illus.

THE fulmar is a petrel belonging to a "bipolar" genus, which means that there are closely related species in both the Antarctic and the Arctic. There are indications that the southern form occupies the ancestral area, and that the northern hemisphere was invaded in the more or less remote past by birds already adapted to life in a polar environment.

The northern fulmar lives in both the Atlantic and the Pacific wherever ice gives way to open water. It has been observed nearer the Pole—within four degrees of latitude—than any other bird.

Up to the middle of the eighteenth century Atlantic fulmars were almost ex-

clusively arctic or subarctic nesters. Until 1878 the only British colony was at St. Kilda, 40 miles west of the Outer Hebrides. About that time a steady increase and spread began, first to the Shetland Islands and ultimately around most of the coasts of the British Isles. In the same period a correlated growth has occurred elsewhere. Iceland, for example, had but a single fulmar colony in 1689, whereas today there are 155! The whole trend represents a now famous "Horatio Alger" story of a wild organism.

Mr. Fisher attributes the "explosion" of fulmar population, in the face of a heavy drain on the young of the species for human food, to excess nutriment supplied to the ocean by man's agency. This commenced with the seventeenth century Spitsbergen whaling operations and has continued to the extensive trawling and fish-gutting of our own day.

The book is a notable example of dialectic exposition as well as a reflection of fine teamwork by Fisher and his collaborators. Aside from the population aspects, it deals with the fulmar's color phases, behavior at sea, voice and display, yearly cycle, parasites, enemies, and food. The impact of the text are as useful in relation to other species of animals as to the special subject of the book.

R.C.M.

THE IMMACULATE FOREST

----- by W. B. Philipson

Philosophical Library, 32 illus., 2 maps

THIS is a well-written book in which the struggles of two English biologists and their Colombian associates to reach the top of the sandstone mountain Macarena, east of the Colombian Andes, are set forth.

Dr. Philipson is a botanist who has,

since the story told in this book took place, accepted a Chair of Botany in New Zealand. His companion, Christopher Doncaster, was the "jack" of zoological "all trades" for the expedition, collecting mammals, birds, insects, and everything else he could find.

Time was lost in the field because the party arrived at the foot of Macarena before the rainy season had ended and before the flooded rivers had subsided. They finally reached a good base camp and cut their way, getting lost a time or two, up the northern spurs to a summit which they named Pico Renjifo. A sketch of the various trails of ascent appears on page 115. However, the altitude claimed, 5500 feet, must be only an approximation because Dr. Philipson explains earlier that their aneroid was made useless by being dropped into a stream. "This was a severe hindrance to us, and for the remainder of the expedition we could only guess at the heights. . . . By taking barometric readings we were able to fix the altitudes on our return, but we could not work out the readings while we were in the field." Why did the party spend only a couple of nights at the summit?

There are obvious slips and errors. No flightless tinamous are known; and how could a jaguar be killed with No. 12 shot? (American No. 12 is exceedingly fine. Perhaps British No. 12 corresponds to our buckshot 1).

In the chapter reporting results, the claimed botanical link with the Guiana highlands is very tenuous and depends upon two genera of plants, *Austrogramme* and *Vellozia*.

There is a blemish that, in my view, mars an otherwise good piece of work. Dr. Philipson devotes a page at the beginning of his book to acknowledgments. Yet, E. T. Gilliard, who was on Macarena nine years earlier, and who prior to Philipson's departure had sent him all available data on Macarena, receives not one word of notice. I can find nothing but dim allusions to previous exploration of this mountain. "Only once before had a scientific expedition reached them (Macarena Mts.), and no one had ever been to the top." Again, "I was expecting to find a plateau because of the reports published by the expedition from the American Museum of Natural History. . . ."

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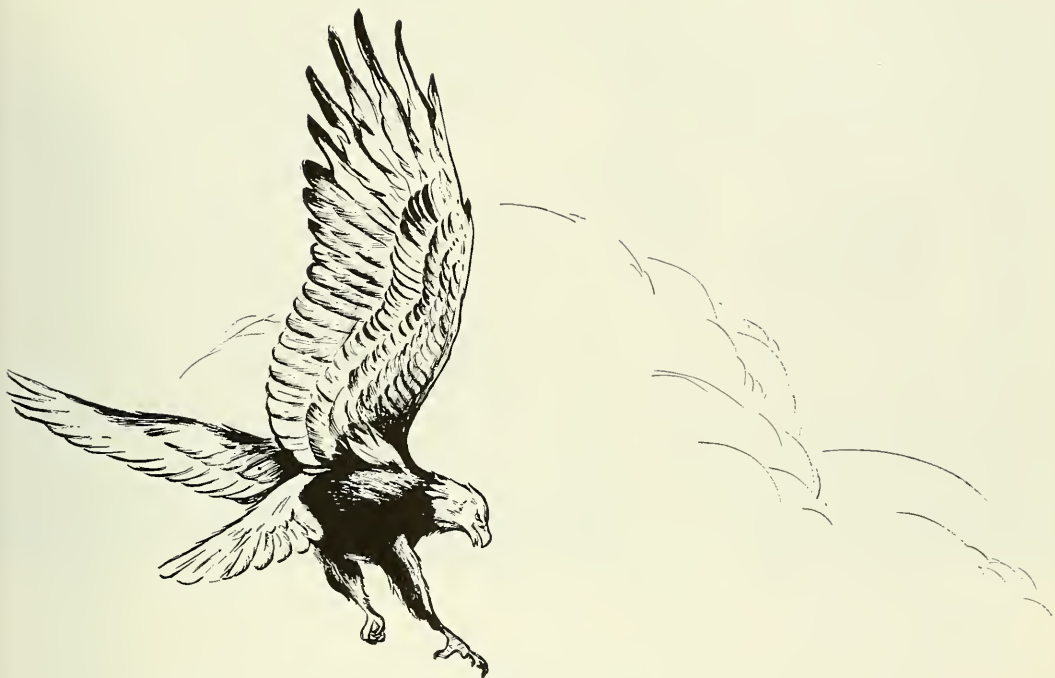
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14 pages, 22 illustrations, some in full color. Paper bound.

BIRDS AND MAN

By Frank M. Chapman

Science Guide No. 115

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This comprehensive discussion of birds in art, history, and the economy of nature should be in the library of everyone interested in birds. As absorbing for beginners as for seasoned students, its classified references to other publications make it valuable in almost any line of bird study.

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INSECT COMMANDOS AID THE ORCHARD Continued from page 117

will be correspondingly held down. Therefore the best control insect may be difficult to find. Indeed, it may have passed unnoticed and be unknown to science, until it is needed in some far-off country to halt the spread of a new agricultural pest."

The greatest pains are taken to make certain that the insect turned loose to subjugate the pest is a true natural enemy of it. The procedure is too complicated to describe here, but as Dr. Flanders says, "The scientists working in this field acquaint themselves well with each natural enemy before it is released to do its work for the farmer or orchardist." What he means by this can be gathered from the fact that the answers to over 50 different questions are sought concerning the habits and inclinations of any insect being considered as a possible clean-up corps.

Another outstanding accomplishment at the Riverside plant was their attack on the black scale, which had always been the number-one insect pest of the California citrus industry. To indicate the expense of fighting it, in the 1926-27 season approximately 40,000 acres of citrus trees were fumigated and 30,000 were sprayed primarily for its control, at a cost of about \$1,500,000. In 1937, a parasite (*Metaphycus helvolus*) was

brought from South Africa. Since the introduction and establishment of this South African parasite, chemicals have had to be used only in a comparatively few areas against the black scale. The cost of this control has been negligible.

In citing these achievements, the Citrus Experiment Station scientists admit that numerous projects have failed, and the expense of these must be added to the cost of the successful ones. Nevertheless, they point out that the successes eclipse the failures many times over. In fact, probably no other investments by the University of California College of Agriculture can show greater returns than those for the biological control of insects.

Furthermore, they wish to make it clear that in their advocacy of the use of beneficial insects to destroy injurious ones, they do not imply that this method will supplant altogether the employment of insecticides. Indeed, they freely praise the notable contributions that the great chemical and oil industries have made in this field and probably will continue to make. They warn, however, that in our enthusiasm for sprays and fumigants, we must not overlook the possibilities of utilizing potential pest-destroying insects. They staunchly contend that the maximum exploitation of both methods—biological and artificial control—is needed in the war of man-versus-insect pests.

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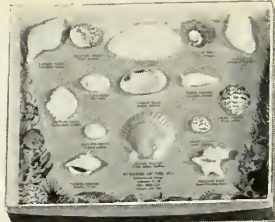
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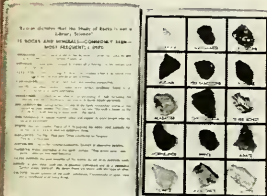


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Bob Bishop photo

▲ MOUNTAIN SHEEP, photographed in Jasper National Park, Canadian Rockies

LETTERS

Skunks in Bottles

SIRS:

I not only enjoyed your article about releasing skunks from traps but was pleased with the humane attitude evidenced in the responses to it and the practical suggestions offered for aiding this interesting animal when it is in trouble.

Twice I have released skunks who had wedged their heads into glass jars.

The best procedure I have discovered is as follows:

First, approach slowly and at the first sign of the skunk's tail rising, stop. Advance slowly when the tail is lowered, then spread a tarpaulin over the animal, up to its head. Firmly grasp the skunk by the scruff of the neck, working through the tarpaulin with gloves. In this way the neck can be steadied and the strain relieved while the jar is twisted loose. The skunk can be carried by the scruff of the neck with the tarpaulin protecting the operator. I believe this is more acceptable to the skunk than being lifted by the tail.

In working around skunks, it is a good precaution to wear goggles, as the scent will cause severe irritation to the eyes. Also, a skunk can bite viciously and should be handled with caution to prevent this. The animal may be reluctant to relinquish its hold on you, and the possibility of rabies infection cannot be lightly dismissed.

As skunks perform a vital service in

destroying insects and mice, they should be generally regarded with greater favor than they are sometimes accorded.

DOUGLAS AYRES, JR.

Fort Plain, N. Y.

A Break for the Sphinx

SIRS:

Your article on the Kansas Pyramids in the February *NATURAL HISTORY* set me to wondering why pictures of the Sphinx are never shown. The *National Geographic*, various Kansas publications, and *Holiday* have all published articles on the Castle Rock and the Pyramids, but the Sphinx always gets left out of the pictures or is so far away that no one can see that it has a beauty all its own.

Last summer I took an afternoon to hunt for the Monument Rocks, and after some hours of wandering over roads that seemed to go on forever . . . I found them. The wind was rising, and clouds were drifting. So I hastily snapped a few pictures and rushed back to the main highway so as not to be marooned in a place where I had no desire to spend a rainy night. . . .

The Sphinx first reminded me of a cobra about to strike. I have since learned that there is a similar formation at Castle Rock actually called the Cobra. My second thought was that it was like a huge bird sitting on top of an enormous pedestal, ever watchful lest some modern vandal might attempt to ruin Mother Nature's sculpturing more rapidly than she herself wants to do it.



I had to carry my films undeveloped for 7000 miles before I returned to my darkroom. The accompanying shot turned out fairly well. The Pyramids will be

Continued on page 191



Read the

good news!

Read how banks help develop new wonder drugs that fight fever

HAVE YOU had pneumonia recently? Have you seen the mercury streak up to 104 and then, a few hours later, ebb back to a normal 98.6?

If so, you've blessed the anti-biotic family, the doctors and the other men who have made these wonder drugs possible. Perhaps you didn't know it, but you've had a hand in their discovery, too. You and your bank.

Dollars at work

One of the dollars you deposited in your bank last payday may be at work right now—helping to produce an even more potent fever-fighter. Or it may be on the war-path against tuberculosis, cancer, polio, heart disease.

Consider the vast sums of money that are needed to fill all the bottles on all the shelves of America's hospitals and its 50,000 drugstores, and you'll understand how vital bank assistance is to the drug industry.

Medicine money

Start with the manufacturer. Mr. Big or Mr. Small, both have payrolls to meet, expensive equipment to maintain—stills, vats, pipes and more pipes. It's a good bet that money from the bank helped them build and grow.

Then there's Research, the doors that click open to new medical frontiers. Bank loans help produce and mass-produce the great discoveries, making them available to all.

Enter the wholesaler. He needs help from the bank, too, to replenish his inventories and keep the corner druggist freshly supplied. From microbe hunt to filled prescription, a bank has usually "gone along" every step of the way.

Right this moment there are 172 billion dollars on deposit in the commercial banks of this nation. Your deposits. Your dollars. Money that's mostly on call, ready to serve every important industry. You may be sure that the dollars that answer that call are helping to build a healthier, sounder, stronger America.

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April, 1953

Volume LXII, No. 4

Billbergia pyramidalis.....Cover Design
From a color photograph by Walter Singer

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*An amateur who made snow and ice his business found plenty of adventure
and is now an expert on the West Coast's water supply*

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geography, and exploration*

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THE COVER THIS MONTH

This spectacular flower, *Billbergia pyramidalis*, is a native of Brazil. Like many other bromeliads, however, it has been grown as a greenhouse ornamental and was cultivated in England as early as 1828.

The variety shown here, which is distinguished by its purple tips, is called *bicolor*. Dr. Lyman Smith of the Smithsonian Institution, who is the authority on this group, believes that the specimen may represent a hybrid, since its flower-clusters are not so densely packed as usual.

Like many other bromeliads, it is able to grow on a tree trunk or branch, instead of on the ground. Plants that do this are called epiphytes—literally plants on plants. Epiphytes are not parasites. They do not derive food from their supporting plant but from rain water that collects nutrient material as it trickles down the branches. Water is often stored in the swollen or cuplike leaf bases.

The color photograph was taken by Walter Singer at the New York Botanical Garden.—
HENRY K. SVENSON

Publication Office: American Museum of Natural History, Seventy-ninth St. at Central Park West, New York 24, N. Y.
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THE SILENT WORLD

----- by Captain J. Y. Cousteau
with Frederic Dumas

Harper & Bros., \$4.00
266 pp., 103 photos
(including 20 in color)

"SKIN diving" is becoming a popular sport, and thousands of enthusiasts are now exploring the underwater or "silent" world. Those who wish to go down the deepest and stay under the longest use an "aqualung." When this apparatus, with its heavy cylinders for breathing, is strapped on your back, you feel as clumsy as a seal struggling about on land; but in the water it is weightless and permits you to swim freely to depths of several hundred feet.

The Silent World is the story of the invention of the aqualung and its use during 15 years in underwater work that included 5000 dives by members of the Undersea Research Group of the French Navy. Captain Cousteau, co-inventor of the aqualung, gives a vivid firsthand account of some exciting and unusual adventures and discoveries. He tells first about the problems in perfecting the aqualung and then how he and his companions used it to investigate sunken ships and live mines, to test the resistance of divers to underwater explosions, to recover the bodies of drowned airmen, to explore a unique inland water cave, to make record "skin" dives, and to photograph some of the wonders beneath the sea. The second half of the book deals mainly with experiences with marine creatures. Unusual encounters with sharks, octopi, and other dreaded marine animals are discussed without exaggerating their dangers. On the contrary, a few creatures are somewhat underrated, such as the venomous spined scorpion fish and the octopus, which can inflict a toxic bite.

This book is exceptionally well illustrated. The underwater color photographs

are the first to be made at depths of over a hundred feet with such elaborate equipment and technical perfection. The publishers apparently used the color plates from Cousteau's recent article in *National Geographic Magazine* and hence could afford to incorporate these remarkable pictures in a book of this price.

EUGENIE CLARK

THE NILE

----- by H. E. Hurst

The Macmillan Co., N. Y.; Constable, London, \$6.00, 326 pp., 32 pls., 27 figs.

THE author of this book has been in the service of the Egyptian Government for 46 years. He spent 40 years assembling the data for *The Nile*, exploring the course of the river and studying facts gathered from every source. He is an authority on this subject, and his book should be a standard reference for many years to come.

The Nile is one of the longest rivers in the world and has played an important part in man's history from the earliest times. The rise and fall of its waters have a profound effect upon the lives of the people who are found along its extent, whether they be the primitive natives of Ethiopia and the Sudan or the more advanced peoples of Egypt. Abundant water from the Nile, for at least part of the year, is a necessity for their very existence. Dams and the holding over of floodwaters to be released in time of water scarcity are now a conspicuous feature of Nile drainage.

Hurst writes entertainingly of all the factors that make the Nile what it is. He tells of its early history and the ex-

ploration that followed each tributary to its source. Some of this exploration took place as late as the close of the last century. The author tells in considerable detail of his own travels along the various waterways that make up the Nile complex. These narrative passages are entertaining and informative.

Considerable space is taken up by the statistics of water volume, irrigation, stream obstructions, and everything that has an impact on the welfare of the people who live in the Nile basin. As examples of the development of stream management, one notes the spread between the primitive techniques, still seen in places today, and the advanced engineering of modern technology.

The book is well illustrated, a good map is bound in the front and rear cover, and there is a useful index.

HAROLD E. ANTHONY

TWO ROADS TO TRUTH

----- by Edmund W. Sinnott

Viking Press, \$3.50, 256 pp.

THE two roads that Dean Sinnott refers to in the title of his book are science and religion; and it is a clue to his philosophy that both lead to truth. Although science and a rationalist view of life have induced many people to accept a philosophy that has no room for religion or for spiritual values, Dean Sinnott believes this in the long run is unsatisfactory, since it leads to a denial of an aspect of truth that can never be ascertained by purely rational or scientific methods. It is this aspect of truth that is fundamentally a function of religion and of the spiritual attributes of man. We need to approach truth by both roads.

Dean E. W. Sinnott is dean of the graduate school of Yale University and a distinguished scientist. He writes there-

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fore with understanding and knowledge of science and not as an opponent. *Two Roads to Truth* is an optimistic book and a sincere reaffirmation of the fundamental values of the Great Tradition of Western Civilization. If he glosses over some of the less attractive details of practice with the more pleasing picture of theory, this is perhaps a legitimate thing to do in a time when the values we all cherish seem in danger.

H. L. SHAPIRO

INSIGHT INTO ASTRONOMY

by Leo Mattersdorf

Lantern Press, \$3.50, 223 pp., 223 illus.

THE contents and style of this little volume indicate very clearly that the author's long association with amateur astronomers has prepared him unusually well for such an undertaking. He is now President of the Amateur Astronomers' Association after working with that group since its organization over a quarter century ago.

The keynote of the book is its lucid style and the fact that the author has not made the mistake, so often found in books on astronomy for beginners, of cluttering its pages with fragments of philosophy and colorful descriptions of natural phenomena.

This is a practical book that will help the beginner find his way through the heavens and explains, in simple language, the mechanics of the ever-changing sky picture. In addition, it also contains a surprising amount of information on the physical nature of stars and planets and such practical aspects of astronomy as time and navigation.

We hope the next edition will contain an index, which would greatly increase the book's usefulness.

ROBERT R. COLES

ARCTIC SOLITUDE

by Admiral Lord Mountevans

Philosophical Library, \$4.50

143 pp., 24 illus.

IN TRYING to review the full history of Arctic exploration up to 1938 and to cover it in 134 pages, the author has chosen to treat the subject somewhat biographically by summing up the contributions of the individuals involved. Where the activities of two or more men overlap in time, the chronology of the drama is thus somewhat confused. It is an account such as might come from a long evening of reminiscent discussion interlarded with quotations, some lengthy, mostly apropos, from varied published sources. Its weakness lies in just the sort of errors that might occur in conversation but which should

not appear in print. Few readers will mind or note such misstatements as the one giving Parry's winter base in 1821 as Melville Island in Latitude 76° 11' N, when actually he was much farther east off Melville Peninsula at Latitude 74° 45'. They matter only when they make one wonder about the whole factual manner of presentation.

To state precisely that the Norsemen wintered on the American coast at Latitude 41° 24' N and to identify as Indians the "Skraelings" who attacked them shows either an ignorance of the present status of the Norse-in-America problem or a willingness to accept as fact a quite debatable version. The reader has a right to know there is a difference of opinion on the subject.

Misleading also are the author's generalized statements on the Eskimo—all of whom do not live in snow igloos and who, as a group, do not include the Chukchees of Northeastern Siberia.

After reading such an account, one wonders more about the publisher than about the author. Does good editing not pay for itself?

JUNIS B. BIRD

TIBET AND THE TIBETANS

by Tsung-lien Shen and

Shen-chi Liu

Stanford University Press, \$5.00

199 pp., 69 illus.

IT might seem that, in recent years, there has been a plethora of books about Tibet. Some of these have been based upon a transient acquaintance, a few upon a longer residence and some actual, intimate knowledge of conditions. They have all been alike, however, in that they were written by Occidentals. In this present book we have the writing of two Chinese, who lived in Tibet in an official capacity and had the opportunity to get a truly inside knowledge of this unique culture. Furthermore, they could understand many things that are difficult for the western mind.

This difficulty of the west meeting the east is demonstrated in the pages of the book itself. The authors make free with the names of Tibetan characters; they are spelled phonetically. But to this reader the impact of the "Nga-Wang Lo-Zang Gyam-Tsho," "Lo-Zang Ch'or-Gyen" and similar patronymics (if such they be!) so taxed the memory that after the battle of names it was difficult to recall who won. Perhaps this situation is unavoidable, but it is likely that such passages will be taken in high gear with no loitering.

The book is a scholarly account of Tibet, including its early history, its customs, its religions and philosophies, and its politics. By virtue of geographical

isolation, in large part due to a topographic protection, this country has been in somewhat of a back water of world politics up until very recently. The advent of Communist China into Tibet is discussed. In many ways this is the most authoritative account of Tibet that has been written since the upheaval of the Second World War.

There are a number of illustrations that vary in quality, some unfortunately being rather flat and lacking in detail. But the coverage of these illustrations is excellent, and they supplement the text admirably.

HAROLD E. ANTHONY

BIRDS OF EASTERN AND NORTHEASTERN AFRICA, Vol. 1

- - - by C. W. Mackworth-Praed and Captain C. H. B. Grant

Longmans, Green and Co., London and New York, \$12.50, 836 pp., 53 color pls., 6 bl. and wh.

MORE people go yearly to the tropics who are accustomed to the excellent illustrated handbooks on birds of their homelands. They are disappointed by the dearth of similar guides to birds of the warmer countries. The avifauna is very rich, but the market for illustrated books very limited.

More than 20 years ago Cyril Mackworth-Praed resolved to provide a good bird manual for Eastern Africa, and he enlisted the aid of Claude Grant who would have time to prepare the systematic foundation. Both men had studied and collected birds in Africa; now we see the fruit of these years of ardent collaboration. Their first volume covers all the non-Passerine birds, also the Broadbills and Pittas, of East Africa and the Anglo-Egyptian Sudan. A second volume, to appear soon, will include the remaining Passeres.

Though designed for field workers, two such fat volumes will scarcely fit the pockets. Yet the ornithologist, amateur or professional, bound for Africa will do well to reserve space for them in his luggage. If any book now in print can ensure field-glass recognition of East African birds, this should be it.

It may be regretted that the color plates had to be kept so small, that maps and sketches are restricted to the margins. Cost of printing is a prime consideration. On the other hand, this volume is packed with varied information about the birds. The 36 photographs from life were largely contributed by Dr. V. G. L. van Someren, indefatigable field worker in Africa.

Much is now known about East African birds; there is always more to be

learned. The day may come when a more compact manual can be produced; that is for the future. Birds often range widely over Africa, and this volume will prove its worth in many other parts of the continent as well.

JAMES P. CHAPIN

HEAVEN HAS CLAWS

- - - - - by Adrian Conan Doyle

Random House, \$3.50
245 pp., 24 illus., 1 map

THE son of Sir Arthur Conan Doyle is a gentleman of the old school, and in order to get away from it all he and his wife went big game fishing and exploring off the east coast of Africa. If this seems cliché ridden, so does Mr. Doyle's approach and reaction to the wonders of nature. Therein, however, lies most of the book's attraction. Mr. Doyle is well bred, intelligent, and keeps himself physically in good shape, but he is no superman. Although he caught a world's record dolphin on this jaunt, he lost many more fish than he landed. Being honest, he reports his miscalculations as well as his triumphs. His efforts thus seem to be of the kind that any of us might put forth, and his adventures could very well happen to all of us. Unfortunately, his knowledge of biology is apparently no better than average. Two-hundred-year-old elephants, deep sea angler fishes with hooks amid their luminous lures, and female sharks that shelter their young within their mouths exist only in hearsay. Although there are numerous venomous animals in the sea, we seriously doubt that practically all of them are as deadly as Mr. Doyle implies.

JAMES W. ATZ

THE HOPIS: PORTRAIT OF A DESERT PEOPLE

- - - - - by Walter Collins O'Kane

Univ. of Okla. Press
267 pp., 24 illus.

THIS is the second book on the Hopi Indians of Arizona to come from the pen of Walter O'Kane, the first being *Sun in the Sky*, 1950, published also in the *Civilization of the American Indian* series of the University of Oklahoma Press. The author, an entomologist by profession, has fallen in love with the Hopi and in both books he leaves us with no doubt of his unbounded enthusiasm for them and their peaceful and self-sufficient way of life.

The present book is more of a look into the past than it is of current Hopi life. In order to isolate out from the mixture that is modern Hopi society those elements that come from the native culture, he

Continued on page 190

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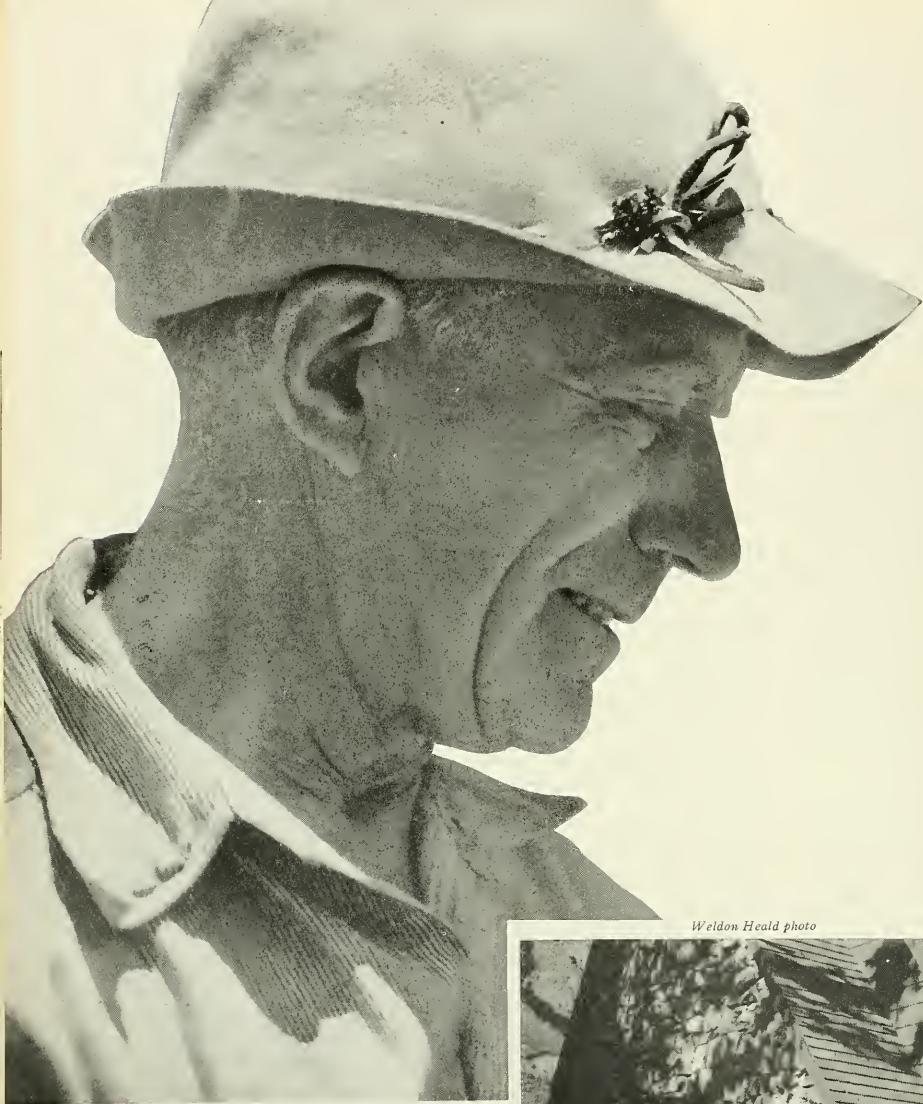
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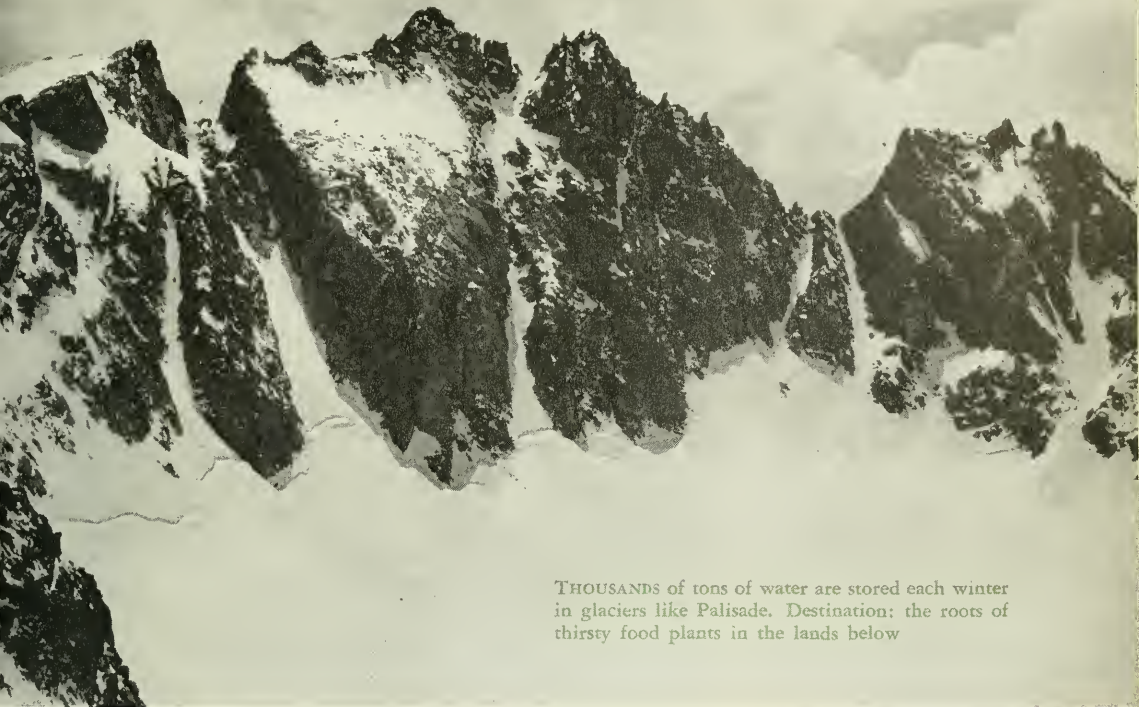
Weldon Heald photo



Photo by Cedric Wright

▲ LET the stay-at-home worry about his waistline, Oliver Kehrlein continues to pursue the energetic hobby of mountaineering even though he has become a great-grandfather. Crops grown in some of our richest valleys depend upon the icy reservoirs that are his special knowledge

➤ A GROUP about to begin a survey of Palisade Glacier, near the border of King's Canyon National Park in central California. Changes in glaciers are important, because they reflect our fluctuating climate. *Left to right:* John D. Bascom, Albert S. Marshall, Oliver Kehrlein, Weldon F. Heald



THOUSANDS of tons of water are stored each winter in glaciers like Palisade. Destination: the roots of thirsty food plants in the lands below

Photo by Joseph N. LeConte

Glacier Man

An amateur who made snow and ice his business and found plenty of adventure. He is now an expert on the water supply of the West Coast

By PHILIP FERRY

ONE day in the summer of 1949, Oliver Kehrlein was tramping through California's Sierra Nevada, his favorite vacation country, when his alert eye caught sight of something that froze him in his tracks. He saw a tiny pool of water at the mouth of an unexplored canyon on the north slope of Mount Pickering.

He had been looking for this pool and the patch of ice from which it must originate. Tom

Howell, a botanist friend, had spotted the milky-white tarn the day before while botanizing. High lakes like this one often indicate the presence of glaciers, and Howell, knowing Kehrlein's interest, had reported his find.

A brief examination confirmed Howell's suspicions and Kehrlein's hopes. The tiny patch of ice that fed this lake was nothing less than a live glacier. Small though it was (it measured only 400 feet wide

by 300 feet long), it was an extraordinary find. It was one more unlisted ice mass to add to his catalogue of living American glaciers. But it also was located 35 miles south of the previous known limit of living glaciers on this continent—a spot corresponding in latitude with Norfolk, Virginia, on the Atlantic coast.

Kehrlein was a happy man that day, and in gratitude he named the glacier Howell, after his friend.

Kehrlein has been hunting glaciers in the mountain regions of the West Coast for 25 years and has about a dozen discoveries to his credit. His pursuit has taken him from Southern California to Alaska, with side jaunts into the Canadian Rockies. Always what he has seen in the past has alarmed him. Mostly his researches have revealed that glaciers are a dwindling resource in the United States. "Ice, a resource?" you ask. Decidedly. Thousands of valley farms are dependent upon glaciers for water. Kehrlein finds fewer of them surviving each

year, and the survivors are receding steadily.

You can prove this for yourself by picking out a more or less accessible high mountain region where a glacier is to be found. This is not difficult if you live almost anywhere from the Rockies westward. Plant some stakes in the glacier near the terminus and on the névé (upper end) and line them up with corresponding markers on the solid ground at the side of the glacier. Return to the spot year after year for a decade and record your findings. Better yet, photograph the progress of the glacier. Almost certainly you will detect a shrinkage in the mass. This shrinkage may be an inch a year; it may be a foot or more. In the case of the Columbia Icefield in Canada, the shrinkage is 100 feet a year, while the Muir Glacier, in Glacier Bay, has retreated 45 miles since Captain Vancouver first viewed it in 1794. Over a quarter of a mile a year!

Those who think of glaciers as being remote from the United States or only as part of the scenery of the Swiss Alps or the polar regions may be surprised to learn there are several hundred active glaciers within the boundaries of our country. These moving bodies of ice and rubble are not merely scientific curiosities. They are active agents in man's struggle for survival on this planet. Kehrlein makes regular trips into the mountain fastnesses of the West, visiting the Sierra Nevada, the Trinity Alps, the Cascade Range, and the higher Coast Range areas, recording the state and movements of these living bodies of ice and snow.

Of what practical value are observations such as his? If glaciers served no other purpose, they would be of absorbing interest because they are a carry-over from the Ice Age. But the grim truth is that in recent years we have come to value the moisture trapped in these solidified pockets as crucially important to our agriculture. Glaciers are highly responsive to variations in temperature, humidity, and

precipitation, and their reactions are a clue to climatic trends. Therefore, many accessible glaciers are being studied regularly. From the accumulating information, it is hoped that a clearer understanding of our water and weather problems will be gained.

Kehrlein is not a professional glaciologist or meteorologist. His interest in glaciers began as a scientific hobby and is a by-product of his mountaineering activities. Originally, Kehrlein was a mountaineer—a breed difficult to classify. Nobody knows exactly why or what a mountaineer is; you just accept him as such and let it go at that. But mountaineering and glaciology are natural partners. The Sierra Nevada is Kehrlein's idea of Heaven. His interest in glaciers as such began in 1923 with a trip to Alaska. A visit to Llewellyn Glacier aroused his interest in these moving bodies of ice and snow. From that time, Kehrlein has been a rabid volunteer glaciologist. Hardly a year has passed without his visiting two or three glaciers of the West Coast.

The most astonishing aspect of Kehrlein's rugged program of mountain-ice investigation is his age. Mountaineering is generally considered a hobby for youngsters. Kehrlein is a great-grandfather! But he is as lean and streamlined as a gazelle, and one would never guess his true age. Mountaineers a generation younger are put to shame by his amazing stamina. More than one experienced climber has confessed that at no time in his own career has he been capable of the vigorous program Kehrlein pursues.

Even for an agile and sure-footed person, ice and snow work in the mountains is fraught with danger. But personal risk does not deter Kehrlein from his investigations.

Surprisingly, Kehrlein is not a punishing walker. He has an easy and effortless gait that takes him over the ground and up a mountain slope with a minimum of effort and motion. Any experienced walker can keep up with him on the

trail; but not everyone can stay with him on a high climb or match the hours he will devote to the investigation of a glacier. His having returned to Howell Glacier on two successive summers is an example of his devotion to duty.

Kehrlein's glacier probings over the years have had one undeviating purpose: the desire to fathom the physics of snow and water in order to work out solutions to some of the human problems connected with them. Actually, there is no dearth of water over most of this continent. The rains and snows provide us with more than enough to satisfy our everyday needs if we could distribute and use it properly. It is our failure to apportion the precipitation that accounts for our present plight.

Glaciologists carry on these observations continually all over the high country. Their periodic reports to the American Geophysical Union form part of the over-all mass of information being correlated and digested by that body. Growth of our population has increased the drain on our water

▼ A GROUP of climbers studying conditions on Mt. Charybdis

Photo by Oliver Kehrlein





Photo by Philip Hyde

MOUNTAIN LAKES like this and the fields of snow and ice feeding them are vital climatic legacy that Oliver Kehrlein is afraid may be disappearing

supply and has made these studies of greater importance. Thus, what was originally a hobby for men like Kehrlein has become a vital contribution to the conservation of one of our important natural resources.

"Some sections of the country could expect a drought every summer and others a flood every spring," Kehrlein explains, "were it not for nature's method of equalizing excess runoff and damming it back at the source with snow packs and glaciers. Man, taking his cue from nature, has built artificial

dams and levees to impound the surplus waters and conserve them for future use.

"Meanwhile, government agencies and hydroelectric companies, alarmed at recurring periods of drought, are frantically filing for water rights on every possible site in our mountain streams. They are even eying our National Parks—to the mounting consternation of conservationists.

"The anxiety of the water men is not without foundation. Evidence indicates our climatic trend is toward a warmer and drier period.

This outlook is based upon a general recession of glaciers during recent decades, backed by weather statistics."

In essence, however, Kehrlein's glacier studies are still only a hobby. He derives little money from the pursuit. However, the renown that has come to him is reward enough for this old work-horse. And he does earn an occasional check for his glacier writings, which make exciting reading, for he has a knack of bringing his glaciers to life for the reader. When he talks about glaciers, his blue eyes light up ecstatically and his heavily tanned features take on a beatific expression, while facts and figures flow in a torrent from his lips like the outrush from the terminus of one of his dwindling giants.

His mountain expeditions are not financed by any institution or fund or foundation. Mostly they are paid for out of his own pocket. Neither is his pursuit of glaciers a rich man's hobby. Kehrlein is not a rich man—although his background indicates the family once possessed considerable wealth. He was born in San Francisco but spent much of his youth abroad. After attending schools in England and Paris, he finished his education at Stanford and Columbia. He studied medicine for a time but dropped this as a career.

Today he lives and works in the city of his birth. He is a Safety Engineer with the State of California and as such supervises the teaching of safety practices in all of California's major industries. This profession might seem to be at variance with his hobby of glacier exploration—a radical sort of diversion for one with an all-absorbing devotion to safety. However, a half century of scaling the country's major peaks, many of them with the use of a rope and all without bodily injury of any kind, is really another proof of his devotion to safety principles.

In what his wife calls his saner moments, he edits the publications of the California Department of

Industrial Relations. Before taking up his present post with the State of California ten years ago, he held a variety of jobs, most of which permitted him to take long summer vacations and enjoy frequent trips of exploration. For some years he was a San Francisco newspaperman, conducting a column on gardening during the summer months and adding one on skiing and related sports during the winter. This program left him with a few seasonal gaps in his work calendar, and these he devoted to mountaineering, which led in turn directly to glacier hunting.

In recent years, part of the expenses of his mountain expeditions has been borne by California's Sierra Club. As one of the leaders of that club's summer vacation outings into the Sierra, Kehrlein literally works his way into the mountains where he can pursue his glacier investigations. The only trouble is that on these outings his ice and snow studies must take second place to his duties as manager of the expedition. Between such chores and the inevitable conferences, he may climb up to a mountain cirque to investigate a glacier he has under observation. On occasion, he will escort a group of campers to an accessible icefield. There the uninitiated may get a direct introduction to California's water supply and learn that it depends upon the vagaries of something as ephemeral as a snowflake. These people are not liable to forget that such widely separated things as the annual snow pack in a remote corner of the Sierra and California's elaborate Central Valley Project are intimately related.

The very fishes of the sea, explains Kehrlein, are no more dependent on water than is man. In fact, the largest fish in an aquarium requires less water per day than the average American citizen. Californians aware of the grim and seemingly losing battle that is being waged to counterbalance a shrinking water table are convinced Kehrlein's hobby is one that might profitably be adopted by

other enterprising individuals in search of physical and intellectual diversion.

Like many of the so-called amateurs in the field of astronomy, Kehrlein has made more than one important contribution to his science. During one recent summer he discovered five dying glaciers in the Sierra Nevada. If the ice in the Sierra continues to melt at its present rate, all of it will have disappeared completely within the next 100 or 150 years. A general climatic trend of this sort might make California as hot and arid as some sections of our Southwest. On the other hand, we may be experiencing only a minor cyclical rise in temperature. The trend may reverse itself at any time and initiate a heavy snow pack and a consequent resurgence of the glaciers. This reversal of climate and lowering of temperatures could result from one of several natural causes, among them an increase in sunspots, a change in ocean currents, or a shift in the north and south poles. Kehrlein even admits the possibility of a man-made cause.

"Man has been equalizing his water supply by building artificial dams and lakes," he points out, "very much as nature does with her mountain-bound snowbanks and glaciers. With these impounded waters, rainless valleys are being irrigated and converted into farms and orchards. Prevailing winds blowing in from the sea will pick up more and more moisture from these plantings and carry it up onto the mountains, where it will condense into banks of clouds. It is just conceivable that this might help reverse a climatic cycle and bring on another ice age."

The Great Ice Age, or Pleistocene epoch, which began perhaps a million years ago, was marked by alternating advances and retreats of the ice. Four times the great glacial systems spread into the low countries, and four times the ice melted back and withdrew from the valleys and plains and even from the mountaintops in moderate latitudes. In the

last of these glacial invasions, the vast Laurentide Ice Sheet extended from Labrador to the Rockies, while the deep Cordilleran ice mass blanketed the mountains of Alaska and western Canada and spread down over the higher mountains of the United States. Along the Pacific coast, it extended nearly to the south end of the Sierra Nevada.

About 4000 B. C., a warmer and drier period seems to have set in. It has been called the Climatic Optimum by Scandinavian scientists, because for them a warmer climate would be considered a better climate. The name is entirely appropriate for northern regions. But warmth and drought probably meant hardship for prehistoric man and animals in some of the drier regions nearer the tropics.

This period lasted until about 4000 years ago, when a new cycle was ushered in, with cloudier skies and more dampness. Thus, we are





▲ SUMMER finds the higher slopes almost bare of snow. Year by year our glaciers are shrinking in size. Water is a dwindling resource in these regions, and glacier studies have become a special phase of

conservation. This photograph shows the crest of the Sierra Nevada. Mt. Thompson and Mt. Powell are seen at left of center. Powell Glacier occupies the hollow above a well-defined terminal moraine



said to be in a "Little Ice Age." There have been significant fluctuations even during this time. Being little finite creatures, as Kehrlein puts it, we like to consider conditions in our own time as normal. But the climate is apparently considerably colder today than it was when the Norsemen established their colonies in Greenland about 1000 years ago. And it is probably warmer than it was when those colonies became extinct around the fifteenth century.

Following the disappearance of the Greenland colonies, the climate seems to have continued to grow harsher for a time. But for the last 100 years or so, our glaciers have

been shrinking for the most part. There is evidence of a gradual rise in temperature during this time. Kehrlein and others of his coterie of scientific glacier-sleuths are watching those shrinking ice bodies as one would eye a dwindling bank account—a resource that is slowly draining away. He feels that proper use of the moisture locked in the glaciers and snowfields should be of concern to the whole nation.

One phase of the long-range program required Kehrlein to pass five days at an altitude that would represent the extreme. In July of 1951, he climbed to the top of Mt. Whitney with Professor Eugene Serr of the University of California

and Walter Wilson and Richard Tarble, chief physicist and meteorologist, respectively, of the U. S. Weather Bureau office in San Francisco. The experiment subjected the men to conditions usually associated with arctic exploration. Their mission was to find out what happens to the snow that falls on our highest mountains. Mt. Whitney was to be the proving ground for many of the theories the men had worked out on Darwin Glacier the previous summer.

With a packer and three pack mules, they rode horseback from Whitney Portal in the Owens Valley to the summit of Whitney. It was the first time Kehrlein had

not depended on his feet and alpine ropes to get him to the top of Whitney. Two of the mules were loaded with the scientific instruments, while the third carried the food and camping equipment. A gasoline stove was included for cooking, since the bare summit provides no wood. For water, they melted snow. They were on a necessarily limited diet as all their food had been transported on the one mule. Even before they reached the top, the packer advised turning back and abandoning the project—and who can blame him, since they were being pelted with hail and sleet and dogged by lightning. As it was, that bewildered gentleman hightailed it for the lowlands the moment he had deposited his charges on the summit.

The expedition set up living quarters of sorts in the stone shelter erected on the broad summit in 1909 by the Smithsonian Institution for studies of solar radiation. Since that time the building had stood unused. Its door had blown down years ago, and the windows were

gone; as a result, the place stood open to the elements. Snow and ice filled most of the interior to the ceiling, and the men had to dig out much of this before they could think of using the building. They finally set their sleeping bags down on a foundation of solid ice.

They could hardly have chosen a worse week. The weather was a nightmare. During their stay, they had one day of sunshine and four days of storms. The men were constantly haunted by the fear of electrical storms. Thunder and lightning were daily occurrences. Gusts of wind charged across the mountaintop like bursts from a jet engine. There was the heart-stopping moment when Kehrlein was certain he had been struck by lightning. He had been crouching in the lee of the building, doing his best to snap a picture of the storm. Something struck his head, but it was a flying eave torn off the building by the fierce wind. On

another occasion the whole party felt they aged ten years when a particularly vicious gust toppled the unhinged door and made it sound as though the building had been demolished at a stroke. Frequently, when working outside, the men would feel the electrical charge building up in the atmosphere and raising the hair on their heads. They would then make a dash for the building, hoping to reach it before the bolt struck.

The men were miserably cold much of the time. The wind reached velocities up to 80 m.p.h., and the temperature stood at freezing or below most of the time. They had no means of heating the stone shelter, and they had to go outside at hourly intervals to take readings of the scientific instruments.

A second observation station was established in a snowbank a couple of hundred feet below the top. Professor Serr, who is a horticulturist in the University of Cali-

▼ **SNOW BLADES**, or sun pits: whatever you call them, they represent the change of season and remind us that part of the orange we eat next summer was ice on a mountain last winter

Photo by James MacBride





Photo by Ansel Adams

fornia Agricultural College at Davis, California, with a special interest in soil erosion, kept a lonely vigil at the lower station for two days, bivouacked in a small mountain tent beside his experimental snowbank.

It has long been known that snow on mountaintops can disappear without melting. For one thing, it can blow off; and a lot of it does from the summit of Mt. Whitney. But it can also evaporate—vanish directly into the air in the form of vapor.

The men on Whitney carried out tests that involved weighing snow, melting snow blocks and weighing the water content, measuring the amount of runoff, and checking evaporation and condensation. They found that evaporation decreased from the desert below to approximately the 9000-foot level and increased slightly from there upward. Evaporation and condensation about balanced each other at high elevations. Evaporation by solar radiation dissipated seven per cent of the runoff, but condensation added about five per cent, depending on the dew point. The tests showed that much less snow was lost through evaporation than some had imagined. About 90 per cent of the water content of the snow ran off through melting.

The stay on Whitney strengthened Kehrlein's belief that we are working backward in our present policy of damming our water at lower levels. The obvious procedure, as he sees it, is to trap the snow-melt high up where the rain-drops and snowflakes fall, in the glaciers and snowbanks on what he picturesquely calls the ridgepole of the range. There are some 20,000 minor lakes in the higher Sierra, many of them strung out like beads in a necklace, and "a small check-dam on each of these lakes," suggests Kehrlein, "would raise their water content by one or two feet. Additional millions of cubic feet of water would then be impounded at high levels where the temperature is low. Here melting and evaporation are consequently minimized and the gain from condensation is greatest. This water would release itself automatically through small outlets, to maintain even stream flow and prevent flash floods. Such controlled flow would also provide better fishing, lusher meadows, and greener valleys. There would be less silting, the nemesis of reservoirs at low elevations."

As a historically wasteful and shortsighted people, faced with an expanding population, it behooves us to look with a miser's eye on

Photo by Oliver Kehrlein



▲ HERE OLIVER KEHRLIN has left his snow and ice and is giving himself a workout on a cliff in Yosemite Park. Believe it or not, in private life he is a safety engineer. But his mountaineering is also a demonstration of his mastery of the science of avoiding accidents

➤ WHEN it comes to water resources, the higher you go the closer you get to the roots of the problem, according to Kehrlein. He photographed this group at a gaping bergschrund on Powell Glacier. He is still finding new live glaciers among our Western peaks. But he is also still finding evidence that our "ice box" is running low

every drop of water that falls upon our land. In short, warns Kehrlein, we'd better get busy with those checkdams, since time and water are a-wastin'.

This solution, be it said in passing, does not please all conservators of the natural scene, most of whom abhor the thought of all those checkdams — inconspicuous and “natural looking” though Kehrlein would have them.

Meanwhile, the country is faced with recurring water shortages. The mountain waters of the West Coast continue to run off into the sea, and parched communities cry out for this fugitive element. Worse yet, Kehrlein estimates that many of our present low-level reservoirs (costing hundreds of millions to construct) will be completely silted-in within 50 years at the present rate.

Until other and more plausible theories are advanced, Kehrlein will stick by his mountaintop philosophy, which has been gained through prolonged observation and great labor. He has not yet achieved the ultimate in his researches, which is to set up a small tent on a living glacier and ride this boreal hobbyhorse through a full year. Such a project, he feels, would provide many other answers to the enigma of where tomorrow's glass of drinking water is coming from. He thinks it would also offer unassailable proof that his solution—those high-altitude checkdams—is an effective one.

Be that as it may, let us hope this final experiment will prove less strenuous than the Mt. Whitney ordeal, which placed an inordinate strain on all participants. A mutual acquaintance who met the party as it came down from its blizzardy laboratory tells me this was one occasion when Great-grandfather Kehrlein looked his age. The setback was only temporary, however. A couple of days later, the old fellow climbed 13,000-foot Mount Ritter—this time out of sheer exuberance and showing absolutely no interest in the water content of anything but his own canteen.



▲ BEAVER MARKS on a cedar tree

Signs of Beaver

By T. DONALD CARTER

*Department of Mammals,
American Museum of Natural History*



THESE two photographs show the activities of the beaver.

This dam has been recently constructed and illustrates how the beaver will take advantage of the natural environment, such as the logs near the far shore, to help in the building of a dam. A beaver dam of any length will seldom extend directly across a stream of water. This illustration shows the curves and angles that are characteristics of the longer dams.

A dam such as this is generally the product of a pair of young beavers that have recently started housekeeping. After a young beaver has been evicted from its home

sometime in the second year, it is forced to shift for itself and may travel a considerable distance before it finds a suitable locality for a new home and also a mate with which to share it. It will have to find a stream suitable for damming, in order to form a pond of sufficient depth to prevent the water from freezing completely. The water beneath the ice provides a storage place for the winter food and an underwater entrance to the lodge.

The location chosen must be near a food supply. Poplar, willow, alder, maple, and other deciduous

trees are generally preferred, as well as water plants such as water lilies. When occasion demands, conifers, such as pine and fir, are also used. As the close-up illustration shows, white cedar may also be cut. Trees near the shore that the beaver does not intend to use for food are often felled and the branches used in construction.

If toward evening an observer, with due caution, visits an environment like the one shown here, he might be fortunate enough to observe these interesting animals at their work.

▼ **WHEN a pair of beavers build a dam like this, they raise the water level enough to build a house with a safe underwater entrance**

Photos by Joseph Golosuka from Don Knight



“**H**ERE is our new tonic-nutrient,” announced bewigged medical men of sixteenth-century Europe, offering spoonfuls of thick dark paste. “It is fresh from Spanish monasteries. Are you weak? One cup of this strengthens you. Are you nervous, unstrung? Drink this, as a baby drinks its milk.”

The new medicine was not only for the aged. In the New World, Spanish maids walked to church carrying prayer books in dainty mittened hands, while behind them walked servants carrying cups of chocolate.

“What?” clacked scandalized matrons. “You mean you intend to drink chocolate in church!”

“Of course,” the maids replied. “Our Father Priest approves.”

So he did. The dark drink kept them from fainting during long prayer sessions.

Exploring Spaniards had discovered chocolate when pointing out to one another the exotic orchards of the Aztecs. “What are those shining trees checkering the hill-sides?” The newcomers found Aztecs making a foamy drink from the almond-like seeds of the trees. “Chocolatl,” Montezuma, elected leader of the Aztecs, called the

drink, hospitably offering cupfuls to the seemingly friendly Spaniards. “Eat of it with a spoon.”

Those early Mexicans roasted cocoa seeds and ground them with corn, chili, and other spices. Or they beat the roasted seeds to a froth, added spice, let the dark mess cool till almost solid. Montezuma was so fond of the froth, according to Prescott in his *Conquest of Mexico*, that “no less than 50 jars or pitchers a day were prepared for his daily consumption, while 2000 more jars were allowed for his household.”

This was Montezuma’s only beverage, eaten cold with a turquoise spoon, served to him cold in a gold or turquoise goblet after he had partaken of his choice of 300 to 3000 dishes prepared for a single menu and deposited by pages on the matted floor before him, where he could point out dishes he wanted to eat.

His head stewards kept hieroglyphic account of the royal revenue: “20 chests of ground chocolate, 80 loads of red chocolate, 200 loads of chocolate, 800 *xicavas* (vessels from which the chocolate was eaten).”

To the surprise of the Spaniards, cocoa beans also served as cur-

rency. A bag of the beans would pass from hand to hand along with clear quills filled with gold dust, and T-shaped bits of tin. Blessed money, because it “exempted its possessor from avarice, since it could not be long hoarded or hidden underground.”

Enterprising Spaniards brought a cargo of cocoa beans back to Spain and showed families how to prepare the energy-begetting froth. “One cup sustains a man on a long day’s march.” There was a certain way to enjoy it. “Open the mouth wide, let the foam dissolve gradually, descend imperceptibly, as it were, into the stomach.” But even after Cortes came home in 1528 with a shipment of the beans, few Spaniards seemed to like the weird drink.

The French did. “Chocolate came over the mountains [from Spain to France] with Anne of Austria, daughter of Philip III and queen of Louis XIII,” wrote M. Brillat-Savarin in his *Physiologie du Goût*. “The Spanish monks also spread the knowledge of it by the presents they made to their brothers in France.”

Young Anne had just married the fourteen-year-old king. Her clear voice in palace halls talked

Originally known only to the Indians, this “Food of the Gods” quickly spread to almost all parts of the earth and today ranks as one of the world’s most relished products

Where Chocolate Comes From

By JENNIE E. HARRIS

chocolate, chocolate, chocolate. "Surely you in France know how beneficial chocolate is!" Her charm and enthusiasm gave it such high rating that when Cardinal Richelieu came down with "general atrophy," he let chocolate cure him.

Fame of the medicine burst into flowering. "That tree that's all colors like a rainbow! Have you heard about it? Take a drink of its roasted seeds, prepared as the Spaniards do it, and how alert it makes you feel—bright, quick, perceptive!"

Madame de Sévigné wrote to her daughter: "I took chocolate night before last to digest my dinner, in order to have a good supper. I took some yesterday for nourishment, so as to be able to fast until night. What I consider amusing about chocolate is that it acts according to the wishes of the one who takes it."

In 1730, a French officer from the West Indies published in London a translation of his *Natural History of Chocolate, Being a Distinct and Particular Account of the Cacao Tree, its Growth and Culture, and the Preparation, Excellent Properties, and Medicinal Virtues of its Fruit*. He interested English-

▼ THE SEEDS that produce cocoa and chocolate come 20 to 50 in a pod, but it takes 400 dried beans to make one pound. The surrounding pulp is eaten by the natives as a sort of jelly

Ewing Galloway photos



▲ THERE may be 20 to 40 of the pods on a tree, but even a 12-year-old tree scarcely yields 40 ounces of the dried beans a year

► THE BEANS must be spread out to dry. This scene is in Guayaquil, Ecuador. Bamboo mats are used on the Gold Coast, drying rooms in Ceylon and Grenada, drying machines in Costa Rica

▼ WHEN the beans have dried, the cacao farmer puts them in bags and carries them to the nearest broker. Probably 700 million pounds of them will reach the United States during the coming year



Ewing Galloway photo



Black Star photo

men by describing chocolate as "very temperate, very nourishing, and of easy digestion; very proper to repair the exhausted spirits and decayed strength; very suitable to preserve the health and prolong the lives of old men." Also, he told of how a surgeon's wife, who had lost the use of her lower jaw, lived on three dishes of chocolate a day, which kept her "lively and robust"; and of how an aged man for 30 years had lived on nothing but chocolate and biscuit and was so

"vigorous and nimble that at four score and five he could get on horseback without stirrups."

For three centuries, household bulletins and medical gazettes acclaimed chocolate as mankind's blessing from the New World. Meanwhile, Spain tried to keep a world monopoly on the beans, kept her processing methods secret and prices high. Young daughters exclaimed, "My dear, of course our family physician prescribes chocolate for my health, but how can we

afford it at three dollars a pound?"

Then British and Dutch explorers discovered chocolate being produced in Venezuela and Ecuador; the monopoly was broken. Some bright experimenter's idea of putting sugar and cinnamon into chocolate, and vanilla from tropical orchards, lifted the drink from medicine to a delectable refreshment. Soon chocolate houses sprang up in London, Amsterdam, Paris—meeting places for celebrities and wits. With reservations, in advance, the elite came plumed and powdered, to dally, jest, and sip.

Guatemalan Indians are credited with inventing solid chocolate—a means of preserving their standard food. Now both powdered cocoa and bar chocolate entered the making of served drinks. About the year 1700 in England, milk was added to the beverage. In 1730, Fry and Sons in Bristol opened the first chocolate factory in England. In 1756, Steinhund opened the first factory in Germany; and in 1776, the Chocolatier Royale opened in Paris.

Even before the year of our Independence, wheels were grinding chocolate beans to a thick paste along the banks of the Neponset River in Massachusetts—the first chocolate factory in America.

General Washington's hungry armies on their terrible white Christmas march might have given much for a few chocolate rations had they known a chocolate mill could roast and grind at small cost. Twelve years earlier, James Baker

helped a penniless Irish immigrant set up a small chocolate mill in Dorchester, Massachusetts, and thus unknowingly fathered Walter Baker and Co.

A half century later, his grandson, Walter Baker, took over the mill; and how proudly men remember that young Abe Lincoln, clerk-ing in a general country store run by Offutt in New Salem, Illinois, stocked Walter Baker Breakfast Cocoa on his log-cabin shelf.

By 1860, the Baker mills were turning out two million pounds of chocolate a year, roasting cocoa beans and grinding them to a mellow paste. The beans came up from Central America; and Americans were eating chocolate to the tune of 3/5 ounce per person a year. By 1900, Walter Baker & Co., Ltd. had won 40 awards from industrial and food exhibitions in America and Europe; and Americans were consuming 48 million pounds of chocolate a year—about ten ounces per person.

Americans were also noticing a charming profile on a familiar cocoa can. Many years before, a young waitress, Babette Baldauf, daughter of a penniless knight, worked in one of those new chocolate houses in Vienna, Austria; and for days and weeks a young Austrian nobleman, Prince Dittrickstein, had been coming to her table so that she could serve him chocolate. Deeply, inevitably, he was falling in love with her.

▼ THE IMPORTANCE of cocoa early in our history is shown by the fact that Baker's Cocoa was the only nationally advertised product on the shelves of this general store at New Salem, Illinois, where Abraham Lincoln once worked. (From an exact replica)

He persuaded her to marry him, and as a betrothal gift had a Swiss artist paint her portrait—paint her as he had first known her, in the full blue skirt, red jacket, bibbed white apron, white fichu and cuffs, her hair hidden under her Viennese cap—bringing chocolate to him! Later, an official of Walter Baker saw the painting hanging in the Dresden Gallery in Germany and exclaimed, "*La Belle Chocolatiere!* That would make an ideal trademark!" So waitress Babette trademarks Walter Baker's Breakfast Cocoa.

Nestlé's, largest chocolate manufacturing concern in Switzerland, nestling near Lake Geneva in the Swiss Alps, originated in 1819. Here where cows wear bells big as buckets and the faint *Kuhreihen* tune of the herdsmen echoes across lush pastures, cows graze richly, yielding top-quality milk that helps make an affiliated product, Cailler's Swiss Chocolate, as sweet and smooth as a popular love song. Five days and five nights of blending also figure in the Cailler recipe for supersmoothness. In 1870, Daniel Peter in Switzerland brought out his sweet, firm chocolate bar—a bar to be eaten like candy—and soon no Alpine climber would think of climbing without his supply of Peter's Milk Chocolate.

Hershey's Chocolate leaped into fame during World War I when our armies handed out chocolate

bars to war orphans. "Want a Hershey?" made sobs stop, grimy hands reach; and right away the name Hershey became almost synonymous with plain and almond milk chocolate bars.

Milton Snavelly Hershey had been a successful caramel manufacturer when he decided to build a chocolate factory in Lebanon Valley, Pennsylvania, his birthplace. "You'll lose all your money. You haven't a chance of success," friends warned. But he cheerfully went ahead and sank a million dollars in a chocolate plant and in homes, lawns, post office, school, bank, inn, shops, gardens. Straightway arose a town full-fledged, as shiny bright as the foil in which Hershey's Milk Chocolate Kisses are wrapped.

Lebanon Valley was essentially farming country. Here grazed thousands of cows to furnish pure, rich milk. Today, 50,000 cows graze on Lebanon and also on Minnesota and Wisconsin grasslands to furnish Hershey's daily requirements.

Hershey — "Chocolate Town" — stays unique, with its community house (rooms for 150 guests), its concrete sports arena (10,000 seats), its fully accredited Junior College, its Junior-Senior High School and Industrial School, its landscaped homes, each with an individual air, its thousand acres of parks studded with sunken gardens, outdoor concert theater, swimming pool, and the Hershey Rose Garden of nineteen acres, which attracts rose-lovers from everywhere.

Someone has estimated that enough Hershey chocolate bars have emerged from their tempting mahogany-colored wrappers to build in duplicate every tower, skyscraper, church, home, and shop in scores of United States cities, with enough left over for sidewalks and streets—Hansel and Gretel chocolate houses instead of the witch's gingerbread! There is no giving out how many Hershey bars have been unwrapped and eaten here and across the world. Even Gold Coasters in Africa buy back



► THE PREPARATION of chocolate is an ancient art. This early print shows Aztec Indians roasting and kneading cacao

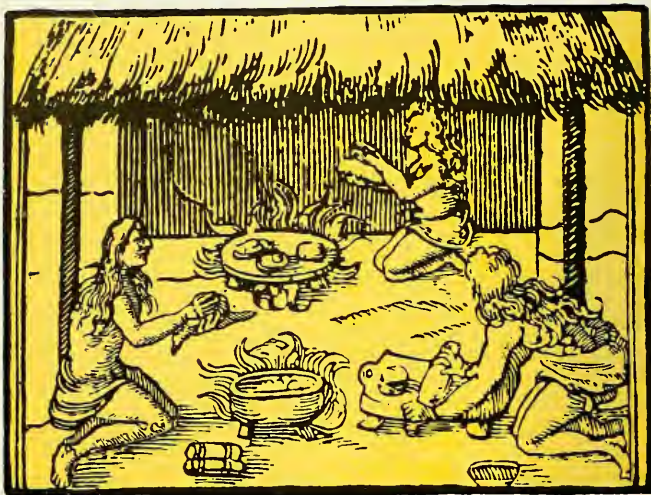
some of their own chocolate in the form of Hershey bars.

Hershey is America's largest chocolate manufacturer, largest in the world, with Rockwood our second.

Rockwood & Co. was formed in 1886 when W. E. Rockwood signed partnership with W. T. Jones, who represented the European Cocoa and Chocolate Manufactory in Manhattan. Rockwood was drowned in Long Island Sound trying to save the life of a sailor. Jones, left sole owner, boxed chocolate creams, put penny chocolate into vending machines, induced soda fountains to pour Rockwood syrup over ice cream sodas. He sold so many barrels of cocoa, so many 100-pound boxes of 10-pound cakes of chocolate to industries that he moved for larger quarters to Brooklyn, near piers where cocoa ships docked.

Soon, "decorettes," hollow chocolate hearts and Easter bunnies, chocolate cigars, Santa Clauses, ice cream sticks, chocolate milk, mint and rum wafers, chocolate gold-wrapped coins, chocolate bits, and other novelties were boosting the United States into the world's largest cocoa user. Then War II, calling for millions of chocolate bars and tons of cocoa, made the United States' chocolate business fat, fast, and furious.

It continues at rapid pace. Africa now grows about two-thirds of the world's cocoa-bean supply. Brazil is second in quantity. Then follow Santo Domingo, Ecuador, Trinidad, Venezuela, Guatemala, Jamaica, Haiti, Panama, Costa Rica, Java, Samoa, Madagascar, and Ceylon. The elegant chocolate tree thrives only within 20 degrees north and south of the equator. Cocoa reaches Hershey, Pennsylvania, for instance, after a 3391-mile journey from Pará, Brazil, or a 5370-mile journey from Sekondi, Africa.



From Benzoni's History of the New World

At the end of the nineteenth century, extensive chocolate tree plantings were made in colonial Africa, along the Ivory Coast and the Gold Coast; in Nigeria, the Cameroons and São Thomé. Also in Ceylon and the Netherlands East Indies.

Tropical America, which previously produced 80 per cent of the world crop, had to give way to the East, but it still holds its own in quality. Each section is distinguished by beans of special flavor, texture, aroma. Criollo cocoa of Venezuela, for instance; Forastero cocoa of Costa Rica.

Lower Middle America has the highest yields. Over 75,000 acres of chocolate trees are cultivated in Costa Rica alone; yet this is only 10 per cent of Costa Rican land that could grow chocolate. Venezuela, once the leading cocoa grower, still supplies its famous cocoa for finest French and Swiss chocolates and for some American brands but occupies third place in Middle American production. Guatemala, formerly exporting cocoa to Spain, must now import thousands of tons a year. Mexico must import several million pounds more than it grows and still grinds chocolate native-fashion, still offers it in hole-in-the-wall markets along with muslin, herbs, cactus candy, and dried fish.

In centuries past, Mexicans have assigned to the chocolate tree a divine origin. In 1753, the Swedish scientist Linnaeus named the chocolate tree *Theobroma cacao* ("Cacao, Food of the Gods"). He must have loved chocolate. *Cacao*, the Spanish name of the tree, is a modification of the Aztec name, *kakauatl*.

The tree is started from seed and is usually grown under taller trees for shade, which are usually leguminous kinds. By its third year, it bears a few bright fruits; but growers try to prevent the fruits from maturing till the tree is five or six years old. At ten to fifteen years it bears most prolifically, and it may fruit heavily until 50 years of age.

Wild, it grows to 25 feet, occasionally perhaps 40 feet, but orchardists keep its height down to 15 feet. A most colorful tree! Leaves are glossy flags of green. New leaves, happening often and starting out pale rose, are limp and soft, forming what are commonly called flushes, which flash here and there like tucked-in butterflies. Waxy-pink or white five-petaled blooms, without fragrance, clasp themselves in clusters directly to the trunk and on older rather than younger branches. This is a curious method of flowering, found generally only among certain

tropical woody plants. They look artificially placed and bloom all year, though often hidden by the broad leaves. Near them, also directly attached to trunk and branches, dangle the seven-inch pods. They begin green and ripen golden, or begin maroon and ripen scarlet; with in-between flecks of gold, bronze, blood-red, green. The silvery bark of the trunk offers its own colors, too, in clinging moss and rainbow lichens. Bud, blossom, leaf, and all stages of fruit happen at the same time all year, so there is no period of drabness or nudity.

Men do the picking, using a knife on a long pole for the high-up pods. Women and children come along and pile the pods into heaps or baskets. The pods are opened the same day, and the piles are carried to a central place for sweating, the seeds being either buried for days or fermented in bins, boxes, or baskets, depending on location.

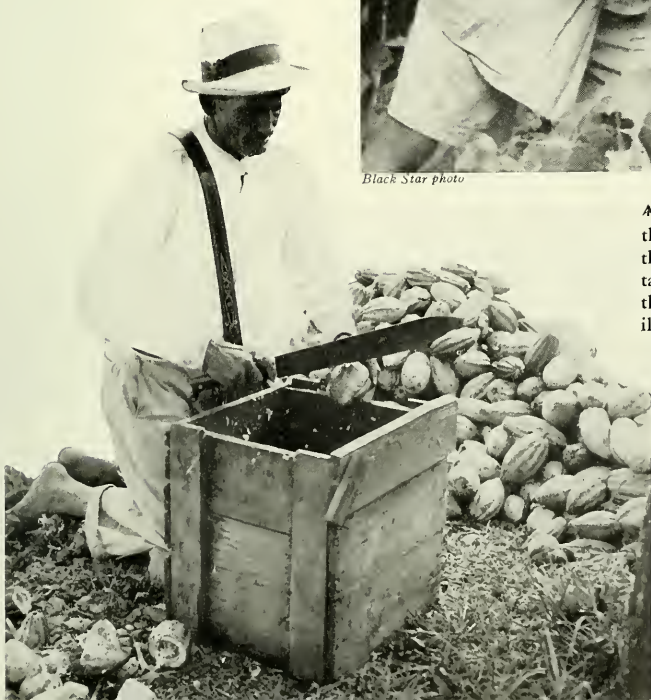
A tree may bear several thousand pale blooms a year. Less than one per cent make pods—generally 20 to 40 to a tree each year. The pods,

Continued on page 187



Black Star photo

▲ AFRICA now grows about two-thirds of the world's supply of cocoa, much of it in the Gold Coast, where this photograph was taken. Curved knives are used for slashing the pods from the tree, as shown in the illustration



◀ A WORKER in a cacao plantation in Colombia. He splits the pods open with his machete and empties the pulp-covered seeds into the box. Here they will be allowed to ferment. By this process, the bitter nonchocolate taste is removed and an essential oil that gives the bean its characteristic odor takes its place

Henricks Hodge photo



▲ WET FEET don't bother a group of scientific sleuths on a hot trail. Viewing the remains of the extinct elephant are (left to right) paleontologist Dr. Manuel Maldonado-Koerdell, Dr. Marie Louise Wormington of the Museum of Denver, archaeologist Luis Aveyra Arroyo de Anda (discoverer of the human implements), archaeologist Carlos Margain, and Dr. Martínez del Río of Mexico's National Institute of Anthropology and History

▼ POSITIONS where the six human implements were found are indicated here by numerals, which can be identified in the close-up illustration of the points opposite



IS there any mystery greater than a woman's age? Yes, say our archaeological detectives—the age of man in the Western Hemisphere. But these scientific sleuths are digging up more clues every day to solve this most fascinating of all mysteries. The organized science of finding and studying the remains of ancient civilizations has only had about a hundred years to develop, and it has hundreds of thousands of years of human life on our planet to reconstruct.

To date, our oldest world citizen is the Java Man—or, if you insist, *Pithecanthropus erectus*—, and he graced that remote Asiatic island some 500,000 years ago. His nearest competitor to the title of Adam was the Peking Man—or, to use his ten-dollar name, *Sinanthropus pekinensis*—, who lived perhaps 50,000 years later.

In our own hemisphere, Columbus was the first Caucasian or white man to arrive on the Middle American scene, but that was only 450 years ago. He and his suc-

cessors stumbled on the highly developed Maya, Aztec, and Inca civilizations, whose histories and cultural predecessors we have traced back to at least 1500 B.C. But what happened before that? For even at the start of our knowledge of these preconquest Indian peoples, they grew crops, made pottery, built permanent houses, and had even developed a stylized ritual art. They were not exactly primitive!

The existence of really old traces of man in this hemisphere was first generally accepted in 1926, when implements of the so-called Folsom type were discovered in

New Mexico. These jumped the age of man to about 8000 B.C., according to Carbon 14 tests.* A little later, the Sandia relics were found to be even older, though just how old was not known. And not until 1947 did any real competition set in. This came from south of the border down Mexico way in the skeleton of the now-famous but highly disputed Tepexpan Man. This prehistoric individual could boast an age of 11,000 or 12,000 years, according to its discoverer, the geologist Dr. Hel-

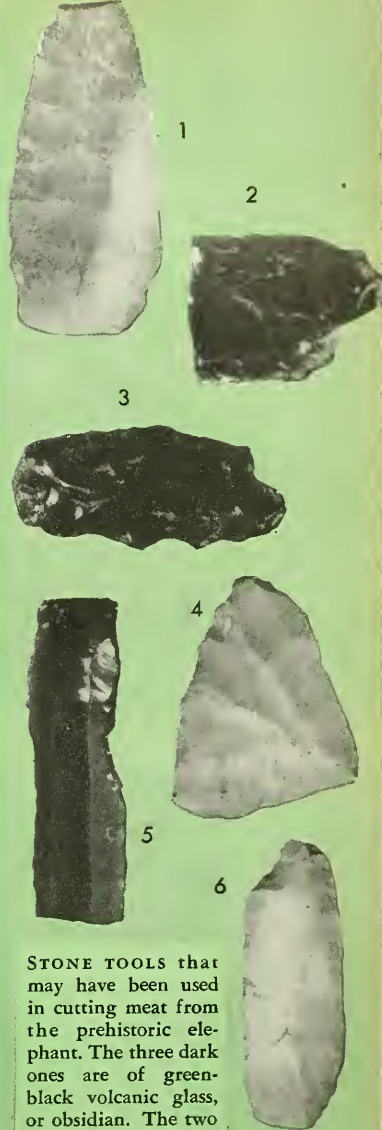
* For further information on the Carbon 14 method of dating, see "Pin-pointing the Past with the Cosmic Clock," by Richard Foster Flint, and "The Cosmic Clock—What Makes it Tick," both in NATURAL HISTORY for May, 1951.—Ed.

The Mystery of the First Mexican

Exciting discoveries in the Valley of Mexico tell of a prehistoric elephant who saw a man but lost the fight

By ANNETTE H. RICHARDS

All photographs by Arturo Romano



STONE TOOLS that may have been used in cutting meat from the prehistoric elephant. The three dark ones are of green-black volcanic glass, or obsidian. The two white ones on the right are of chalcedony. The projectile point at top left was identified by Dr. Wormington as being very similar to the famous Scottsbluff points scattered widely over North America. The pieces were discovered in the numerical order shown. Scale 2/3 natural size

◀ AS THE BONES were uncovered, Point No. 3 was found as the arrow shows. No. 4 came to light later where the cross is

mut de Terra. Tepexpan Man was offered as proof of man's existence toward the end of the Glacial Age in Mexico. But the experts did not agree. While blood pressures were high, the whole matter, so far as general professional agreement was concerned, was put on ice.

And then, five years later in 1952, and within two air miles of the place where the Tepexpan Man had been found, came evidence that men were in the Valley of Mexico possibly as far back in time as had been claimed for him. Perhaps, after all, Tepexpan Man was

eligible for the title of Early American.

What was this sensational new evidence? The bones of a prehistoric elephant of a type now extinct, with six human implements, found at Santa Isabel Iztapan in the Valley of Mexico. What was the age of this animal and his human contemporaries? Twelve to fourteen thousand years have been claimed! A Carbon 14 test performed by Dr. J. Laurence Kulp places the date at a more conservative 9000 years, plus or minus 250. A study of the pollen in the muck around the bones and in the bone cavities raises some question whether the C 14 sample was as old as the bones themselves.* At any rate, it is a venerable age, certainly, when you consider all that has happened in human history



▲ THE SITE of the discovery at Santa Isabel Iztapan was a pleasant spot, until water began to fill the hole

* Mrs. Kathryn H. Glibby of Oberlin College has found pine pollen in the layer where the bones occurred but quite a different pattern, with spruce pollen, in the bone cavities. It is conceivable that somewhat later muck was forced down around the bones by the weight of accumulating overburden. This would mean that the bones might be older than the muck used as a sample in the C 14 test. —Ed.



▲ ARCHAEOLOGIST Aveleyra fights against time and the seepage of water as he continues his painstaking excavation of the extinct elephant

► HERE archaeologist Aveleyra carefully brushes some dirt from one of the bones of the prehistoric elephant



since then—man's slow emergence from the Stone Age, the glory of Ancient Egypt, Pax Romana, the Dark Ages, the Black Plague, the Renaissance, the Industrial Revolution, the Russian Revolution, totalitarianism, and the Atomic Age.

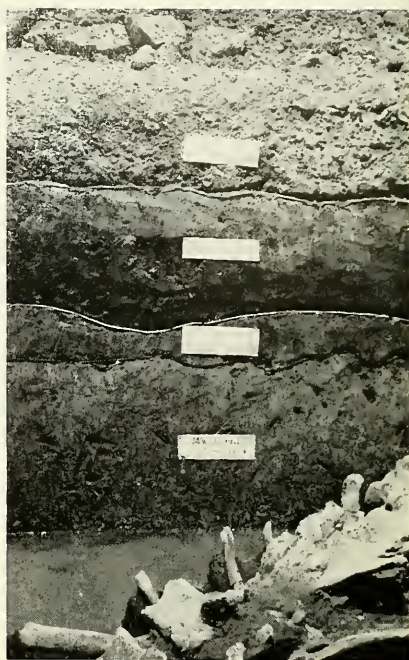
We know pretty well what went on, humanly speaking, in the Americas since the time of Christ, but what happened between this known period and the life of the Santa Isabel Iztapan man? This is the question that intrigues our modern archaeological sleuths.

“¿Quién sabe?” How to tell a woman's age! You tell a horse's age by his teeth. You tell the age of a tree by its annual growth rings; dendrochronology is the fancy name for this science, by which it has been possible to date so many ruins in our Southwest. But how do you tell a prehistoric man's age?

The two basic sciences of age are geology and paleontology. The geologist studies the different layers of rock and can determine their ages with considerable accuracy, especially in the case of

the younger ones. The paleontologist investigates the fossil remains or impressions of flora and fauna and works out the sequence of plant and animal life.

For more recent but still prehistoric times, and for the fine points of dating, the archaeologist takes over with a few special methods of his own. His field is limited to the last million years, the age of man, a mere drop in the bucket of geologic time. His best age-detector is the famous Carbon 14 method mentioned above, a complicated technical process. He also keeps track of the geological strata in which human relics are found, carefully observing any paleontological data at the same time. In certain preferably dry climates with cultures that are not too old, fragments of wood or charcoal showing the pattern of tree-ring growth can be used for dating. Comparison of pottery, architecture, tools, art, textiles, etc., with those of other known cultures are usually effective. A new method of estimating the comparative ages of different



▲ EASILY distinguished layers aid in deciphering the geologic story. There is reason to believe that lands to the north may have been still in the Glacial Age when the elephant found here was alive

▼ DR. MARIE LOUISE WORMINGTON (wearing hat) and Jane Holdon, Director of the Museum in Lubbock, Texas, who is studying in Mexico City, standing on a bit of dry land near the bones



deposits by studying the mineral salts present in them is being developed by Dr. Peter V. Sokolof, geochemist of the Isaiah Bowman School of Geography of Johns Hopkins University. He is working with sedimentary deposits at various places in the Valley of Mexico, including that of the Tepexpan Man and of the Santa Isabel Iztapan elephant. His conclusions have not yet been published.

Our Ancient American had his happy hunting grounds in a region whose climate and scenery were the kind that Chambers of Commerce dream about. The Valley of Mexico, although in a subtropical zone about 1000 miles south of the United States, had the great advantage of a 7000-foot altitude, which gave it superbly warm, clear days and delightfully cool nights the year around. Ringed by volcanic mountains, among them world-famed Popocatepetl and Ixtaccihuatl, the view was beyond compare. And, to complete the idyllic picture, ancient Lake Texcoco covered a good part of the valley floor, even up to the time when Cortes first arrived at the Aztec Venetian city of Tenochtitlán. Through extensive drainage programs since that time, Lake Texcoco has shrunk so that it now covers only a small part of the fertile valley in which Mexico City stands. But this lake and the mild climate attracted all manner of prehistoric animals. And since our earliest known inhabitant made his living by hunting, it proved a good headquarters for him. In fact, this valley that so favors human and other life has been continuously inhabited ever since.

The first citizen of Mexico did not know how to grow food. His implements were of stone and supposedly of wood and bone. How, then, did he kill those giant ground sloths, imperial mammoths, camels, wolves, horses, bison, and elephants that were wandering around loose? A civilized man with a powerful gun sometimes has difficulty killing an elephant. The elephant at Santa Isabel Iztapan was much

larger than a modern African elephant. William Tell's skill in shooting the apple off his son's head with a bow and arrow is considered one of the remarkable feats of all time. And there are—and have been—few Howard Hills who can actually kill big game animals in Africa with a bow and arrow. Were this prehistoric man and his friends, who did not know the use of the bow and arrow, any more skilled? I doubt it.

If you were in his position and dinner time came along, you might use the technique the Plains Indians used on the buffalo. Having only some rough stone points attached to wooden shafts, you would drive the animal over a cliff or into a swamp, where the big clumsy creature would be trapped in the mud. This may have been what these elephant-killers did. After the animal floundered into the swamp, the hunters either waited for him to die or possibly killed him when he became exhausted and then proceeded to cut off the meat. One leg of the creature was dragged about seven feet away from the carcass, either by these prehistoric butchers in their attempt to get at the meat more easily or possibly by animals.

This is a sketchy picture of this prehistoric man, but it is a significant piece of the jigsaw puzzle that archaeologists are gradually fitting together. In fact, the excavation of the Iztapan find was the first major work conducted under the auspices of the brand-new Department of Prehistory of the National Institute of Anthropology and History in Mexico City, 22 miles to the south. It is not the first discovery in which human artifacts have been found in direct association with the bones of extinct animals in the Western Hemisphere, but you can count such discoveries on the fingers of one hand.

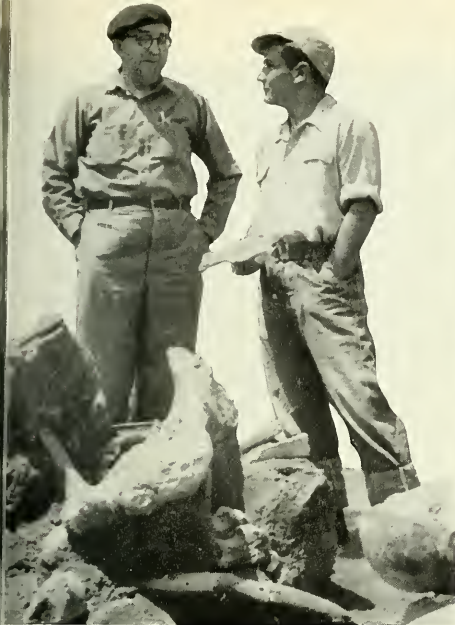
Who found the Iztapan bones and tools? A young and very promising Mexican archaeologist, Luis Aveleyra Arroyo de Anda. And



▲ AVELEYRA DISCUSSES the discovery with Secretary of Economy, Martínez Baéz, while his collaborator, Maldonado-Koerdell looks on and the crowds watch

how? By accident, as so often is the case. Two years earlier, some workmen had been digging a drainage ditch near Santa Isabel Iztapan when their picks struck the skull of a giant extinct elephant. The archaeologists hurried out to have a look, but since this was just another elephant in an area that seems to be a cemetery of elephants, it was not sensational. Besides, they needed money to pay for an expedition. So they were satisfied to take home a few specimens and make a mental note to return when opportunity knocked.

It knocked two years later. And Aveleyra hit the jackpot! On the third day of the diggings, March 13, 1952, he found the first of six human implements right between two bones of the extinct animal—obviously directly connected with it. He was so excited that he jumped into his car, drove to the nearest telephone, and called the Director of the new Department of Prehistory, Dr. Pablo Martínez del



▲ ALFONSO CASO, Director of the National Institute of Mexico, talks with archaeologist José Luis Lorenzo beside the bones



▲ HERE are most of the experts who are actively connected with the discovery. *Topmost:* Dr. Manuel Maldonado-Koerdell, Dr. E. H. Sellards, Dr. Ignacio Bernal; *middle-left:* Alex D. Krieger; *bottom row:* Dr. Pablo Martínez del Río, Dr. Marie Louise Wormington, Luis Avelayra Arroyo de Anda, and Carlos Margain

Río, and paleontologist Dr. Manuel Maldonado-Koerdell. Dropping everything, Doctors Martínez del Río and Maldonado-Koerdell rushed to the scene. They, too, were so excited by the significance of this development that they worked until midnight searching for further proof of the co-existence of man with this ancient animal.

They notified two of the leading authorities on the antiquity of man in the Americas, Dr. Marie Louise Wormington, of the Museum of Denver, and Alex D. Krieger, of the University of Texas. Dr. Wormington, Mr. Krieger, and Dr. Elias H. Sellards, Director of the Texas Memorial Museum in Austin, flew down to see the tools and bones *in situ*—that is, in the exact position in which they had been found. They stayed to watch the diggings. Said Dr. Wormington, "It is the most important discovery of its kind ever made in the Americas."

Archaeologist José Luis Lorenzo

and physical anthropologist Arturo Romano, who both took an active part in this discovery, placed the six small stone objects in the palm of my hand in Romano's office on the roof of the National Museum in Mexico City. When I looked at these rather crude artifacts, it was hard to realize how important they were. And when one looks at the six-foot-deep water hole in which they were found (the scientists had to battle with pumps to keep the water seepage under control), it is strange to think that there lay the remains of a man and an animal who lived so long ago!

We now come to the question that intrigues all archaeologists, both amateur and professional. Where does this new chapter fit into the whole story of man's physical and cultural evolution?

Our scientists are agreed that man originated in the Old World. How do they know? Because Europe, Asia, and Africa have yielded

primitive human remains that differ so much from any living races that there is no doubt that they must be assigned to an earlier evolutionary level. But no living or fossil primates—man's nearest relatives in the animal world—have ever been found in the New World. And, despite his venerable age, Tepexpan Man does not represent an earlier physical type but rather a modern one. Nor would 10,000 to 15,000 years be time enough for basic physical changes of this degree to have occurred in the Indians who may be Tepexpan's direct descendants. In all probability the human race therefore originated somewhere in the Eastern Hemisphere, and the ancestors of the American Indian migrated to the New World in the region of Bering Straits and thence to Central and South America.

The 64-dollar question is: when? The Iztapan discovery is helping to solve this mystery. We now have proof that very primitive peo-

ple lived in Mexico as much as 9000 years ago.

Other interesting questions are: how long did it take them to arrive there from Alaska? And did the Aztec, Maya, and Inca civilizations develop entirely from such humble beginnings? They may have borrowed from Asia through later migrations, of course. But the few striking cultural similarities between the civilizations on opposite sides of the Pacific are believed by most anthropologists to be either happenstance or to have come about through occasional random voyages across the ocean such as probably occurred even in ancient times.

The wonderful thing is that archaeology is digging up our own back yard at last, not just going to faraway places. Most archaeological research has been done in the last century and probably half of it in less than 50 years. But only in the last 25 years have scientists directed their efforts intensively into the cultures of North and South America. Archaeology has made remarkable progress, especially in its first love, our American Southwest. And now it is probing deeper and deeper into the remote past.

A few years ago, most self-respecting archaeologists scoffed at the suggestion that man had lived in our hemisphere 10,000 years ago. But new discoveries have extended our knowledge and pushed our conservative skepticism further and further back. Do you see why one young archaeologist with plenty of experience in drenching rain, blistering sun, freezing snowstorms, and mud puddles, said, "This is a terrible business, but I would not give it up for the world!"

"Let the dead past bury its dead"? Not on your life! Let the living present unearth the past—and incorporate what it finds into our lives.

Keep an eye on Mexico. Things are humming down there, and they show every promise of new surprises.



▲ THE NEST usually contains four or five eggs, which are light in color with brown or purple markings

▼ THREE of the eggs have hatched; the fourth is still intact



The Song Sparrow

Its voice is one of the cheeriest sounds of spring

By CLIFFORD E. MATTESON

NO TIME of the year brings forth more changes in nature than spring. This is the time of blossoms and new-born leaves, and of the fresh greens of new grasses. Most of all, it means the return of many of the birds from their southern migration.

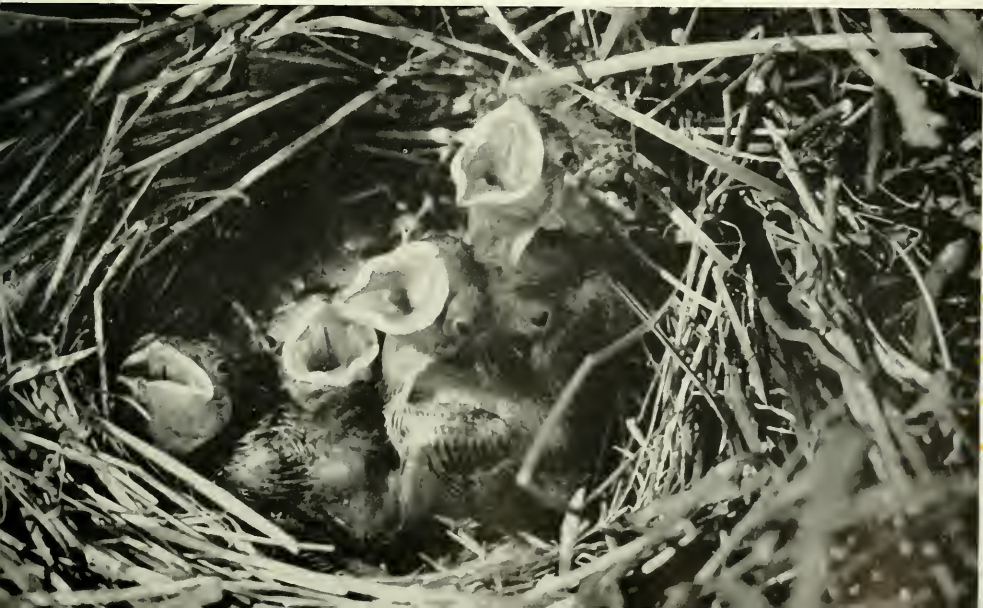
Who in this season of rebirth has not listened with a swelling spirit to the melodious notes of the Song Sparrow? Its persistent voice, defying even the late-season storm, renews our trust in the cycle of the seasons and instills the hope of brighter, warmer days.

It is fitting that the scientific name of this vocalist should be *Melospiza melodia*—"the melodious song-finch." If you draw close to its nest, you may see some of the things shown in these photographs.



▼ A FEW DAYS LATER, all four chicks were found awaiting their feeding as shown here

▲ ONE of the young birds is now ready to try out his wings





▼ AN EXAMPLE of the animal figures that are being made by the fabricators in the province of Guerrero and sold to visitors as genuine antiques

▲ A MODERN CARVING palmed off as ancient: a mask simulating Olmec style. Some 5000 fake artifacts of various sorts have probably been sold since 1930

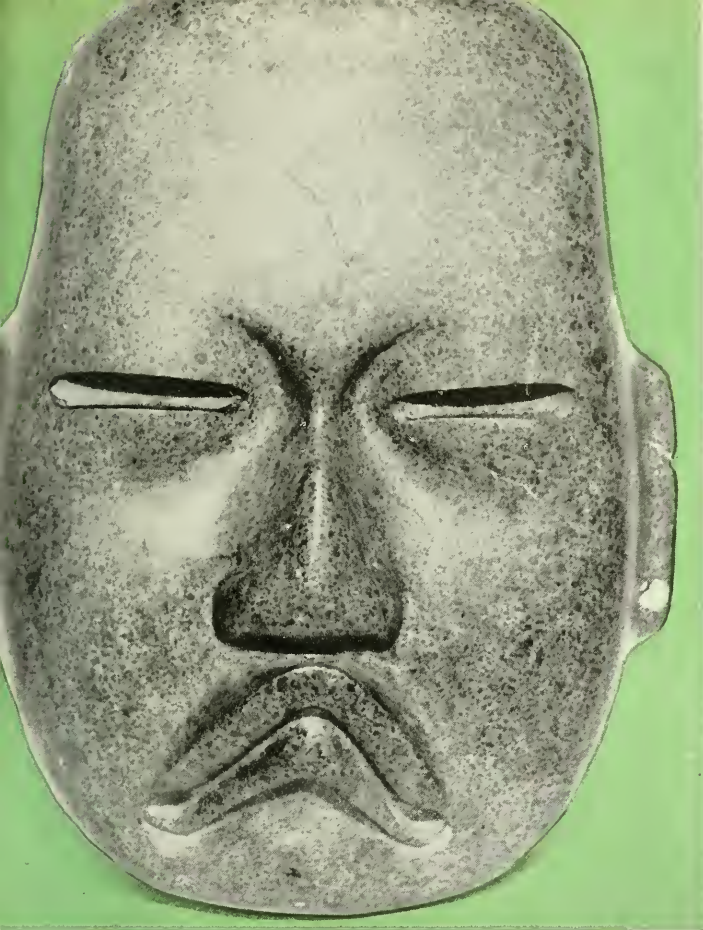


FACES that are

Fake antiquities—stone masks, statuettes, and pendants—
are flooding the tourist market in Mexico
and undermining historical research

By FREDERICK A. PETERSON

Photographs by the author, courtesy of the Wenner-Gren Foundation for Archaeological Research



▲ ANOTHER IMITATION of the Olmec style of carving. The makers have ways of "aging" the stone so that even an expert sometimes has difficulty detecting the deception

eally FALSE

IMITATION works of art like the examples shown on these pages are being offered to tourists in Mexico as genuine antiquities, and they threaten even to find acceptance in academic circles.

They come from the state of Guerrero, in which the well-known town of Taxco is located. They are

made in the form of masks, plaques, and statuettes; and some 5000 of them are believed to have been made and sold during the past 20 years. If their origin is not challenged, there is a possibility that time may sanctify their respectability and that they may in future even compromise important

conclusions concerning Middle American archaeology.

They are so well-made and ingeniously cracked, chipped, and aged that some dealers, and even old-time collectors, have been fooled. This does not mean that all the work is excellent. The great majority of the pieces can readily be distinguished as false. However, when the well-done pieces are examined, it is difficult even for those who have had some experience in the field to distinguish the ancient from the modern.

The masks are made by different workmen and are also made in different classes or styles. The best pieces are rarely sold in the open market but are given to dealers, who dispose of them with appropriate stories as to their origin. Sometimes the dealer is no doubt innocent of any deceit, but this is not always the case.

There have been instances in which dealers have gone to the length of burying objects in a mound or near a village, or getting some poor Indian, for a small fee, to bury them near his hut. Then some gullible and moneyed victim is informed that the marvelous things are being found, and he is given the privilege of watching the "excavations"—and also of purchasing the objects found.

Often one familiar with Middle American art can readily distinguish a modern mask from an ancient one by taking note of the general "feeling" of the craftsman toward the stone and evaluating the symmetry and internal balance of the piece. But usually there is at least one specific mistake that will label the piece as false. The stone may not show any signs of having lain underground or been mistreated by the natural forces of erosion or shifting earth. The boring may be poor or not in pre-Hispanic conical style, or the eyes may be out of proportion. Signs of modern tool marks may remain in the corners where they were not properly erased by polishing. Again, the nose may be too wide, the eyebrow ridge too wide or too



sharp, etc. The workman sometimes gives himself away by putting identical details on a Teotihuacan-type mask, an Olmec mask, and a Mayan mask. And there are a few other telltale features that I could mention; but if they were made known, the falsifiers would be tipped off.

▲ A MODERN THIN STONE HEAD—Totonac motif. Some of the fakes have been copied directly from authentic carvings shown in scientific publications

The counterfeiters are continually asking collectors and dealers to criticize their work and to point out mistakes. Thus, after many years of experimentation, the artisans now know how to avoid many

mistakes that are apt to arouse the suspicions of the less gullible, and they take great pains to make their best work look as much like the genuine antiques as possible.

To do this, they will break off

little pieces of the mask, crack it, or scratch it, and then artificially age the resulting fractures. A common way of aging the mask is to bury it in acid-moistened soil or to pour urine on the soil. The masks are also rubbed with pebbles, sand, or other silica-containing material that will produce "natural" scratches. Iron staining is imitated by using mild acids. Surface texture indicative of age and the mineral accretions that are sometimes found on ancient carvings are applied by chemical methods and by burying the pieces for long periods in heavily mineralized soil. Sometimes a mask will be buried in shallow limy earth and a fire built on top of it.

The counterfeiters are now expert enough to produce signs of aging in crevices in the stone, and they can put a limy accretion or a yellow-green deposit in the corners and cracks. Primitive boring methods are used on the best pieces, and core-marks and other signs of boring are often left on purpose as "proof" of antiquity. The modern tool marks are erased by using a white and slightly abrasive powder, which is applied to a moistened revolving cloth

disk, somewhat like a shoemaker's. The author has not been able to procure any samples of this powder for analysis.

Some dealers co-operate by lending the artisan originals to copy. The artists also borrow books containing illustrations of genuine artifacts and then reproduce whatever takes their fancy. They are such good imitators that a case is known in which a collector possessing a genuine piece, wanted it quadruplicated for gifts and later found that it was difficult to pick out the original one until he had examined them all carefully. More than one mask has been copied directly from the authentic originals published in *Mascaras Mexicanas*, issued by the Sociedad de Arte Moderno in 1945.

The masks are made of stone in a variety of colors, but greenish is the favorite. Of course, customers are told that all of the green stone is either "jade" or "jadeite." The green comes in many shades, and a single piece may have a light green base with very dark green blotches, mingled with white or "liver" spots. The stone varies considerably in hardness, but the hardest stones are preferred. Often there is much white or olive or brownish mottling, so that the substance looks like a composition material.

The author has, indeed, seen some masks that have been made by casting in cement and composition material. When suitably dyed and polished, they appeared at first glance to be very good imitations.



▲ THE ORIGINAL of this imitation was an authentic piece reproduced in *Mascaras Mexicanas*. It is a mask of Huehuetotl, a Fire god

◀ A MODERN FIGURE combining various motifs. The makers of these imitations sometimes work closely with dealers who lend them genuine pieces



Other natural stones used include andesite, chloromelanite, granite, basalt, serpentine, greenstone, wernerite, limestone, onyx, quartz, obsidian, and rock-crystal, in many shades of green, brown, gray, and white.

Impetus was given to the spurious trade by recent finds of Olmec material at La Venta, Tres Zapotes, and other archaeological sites. Collectors immediately had a burning desire to acquire some of the lovely jade pieces found at these places. If the copies had been clearly labeled as modern, perhaps no great harm would have been done. But, as already stated, if these pieces gain the aura of respectable antiquity and work their way into museums, it will certainly not be to the advantage of art or science.

Lovely "baby-face" figurines in the round are now being made, but no photographs are at present available. There are also very fine masks with Olmec traits, and two examples of these are shown on pages 176 and 177.

Stone copies of clay objects are sometimes made by the fabricators, and the result is a new type of stone artifact of which the face on this page is an example. Some-

times they even combine motifs from several different cultures in a single object, and the finished product is slightly bewildering.

Work in rock-crystal includes figures of rabbits, frogs, skulls, hands holding skulls, and small statuettes. Sometimes the same work is done in a semitransparent purplish stone. The craftsmen take particular delight in making animal figures—lizards, crocodiles, jaguars, birds, etc., and these are well-made and most decorative. An example of this sort of figure is shown on page 176. Effigy bowls also are made, sometimes decorated with snake motifs or with supernatural figures in human form.

Another sideline is plaques, which usually have anthropomorphic designs and most often are

in light-green stone. They are quite flat on the back, with the face generally shown in profile. Besides the foregoing, the artisans also take disks and carve pre-Hispanic figures and symbols on one or both sides.

To make things even more unfortunate, dealers will often bring to the craftsman genuine disks for remodeling and retouching. The result is a composite that can scarcely be called valid art and is certainly a threat to the traditions of authentic collecting as well as to the conclusions of scientific archaeology.

To sum up, caution should be exercised regarding any masks, plaques, animals, Olmec figures, Totonac artifacts, or rock-crystal, onyx, and obsidian carvings.



▲ A STONE IMITATION of a style of mask originally executed in clay. The genuine "smiling heads" often came from Vera Cruz

◀ ANOTHER STONE IMITATION of a type of figurine more likely to be found molded in clay





▲ Considering a plunge

◀ Going down the gangplank

▼ Don't anybody mention the "dog-paddle"

Paul, *The Swimming Cat*

He fished and swam in the ocean

By ERNEST S. CLOWES



AS from time to time I have seen in your magazine the question raised as to whether or not certain animals can swim, I thought the enclosed pictures might be of interest to readers.

I took the pictures some 45 years ago and recently found them in an old album. The cat was one of a semiwild breed that lived along the ocean beach. I tamed him as a kitten. His mother was used to the water, for she used to bring her kittens small fish and would come in from fishing expeditions wet to her body.

This one of her offspring had little fear of water. He got used to wading along the shore of the bay and rather enjoyed going out in a boat. One time I stood ashore and called him, and what followed is well illustrated by the pictures. In (1) he seems to be considering a swim; in (2) he is about to make the plunge; in (3) he is swimming. It became something of a habit with him on warm days. On one occasion, the sequence was reversed. I went out in the boat and called him and he waded in, swam out to it, and came up the oar as

if it were a gangplank, evidently confident that it would be provided.

He had a long and useful life. I once saw him bring in seven field mice in the course of a morning. He had a summer and a winter home for quite a few years, with each of which he was perfectly familiar on arrival. He knew his name, Paul, very well; and had many human friends. He met an untimely death at 16 years of age, when he was hit by a car one foggy night on his way home from a hunting expedition.

NORTH in the spring, south in the fall—that is the schedule followed by most of our migrating birds. But in all societies there are a few nonconformists, and among our western birds one of these is the Heermann's Gull. Its strange habit of wandering northward in midsummer brings this beautiful bird into our realm as a fall and winter visitant. Its interesting family life is one of the spectacles that rewards the traveler who visits the Gulf of California.

Despite the nearness of the Gulf of California to the United States, it still remains almost unknown, and most maps of the region are ancient and entirely unreliable. One chain of five sizable islands is designated on charts by a single dot, even though the chain stretches for fifteen miles. Furthermore, ten miles north of Raza, where we observed these Heermann's Gulls, there is an island that is known to mapmakers as

◀ **TOWARD EVENING** on any day in April, thousands of Heermann's Gulls fly back to their nesting sites on tiny Isla Raza, carrying food for their young

▼ **THE NESTS** are about two feet apart. During most of the daylight hours, only one adult guards each of them

Photo by Robert Meanley



They are the picture of affability when riding the waves of the Gulf of California,
but they are villains in the eyes of the nesting terns and the ospreys

Heermann's Gulls

AT HOME

By LEWIS WAYNE WALKER

*All photographs by the author
unless otherwise credited*

Partida, whereas the Mexicans say that the real Partida is 20 miles to the south. Such discrepancies show a woeful lack of exploration, and it is doubtful that any other

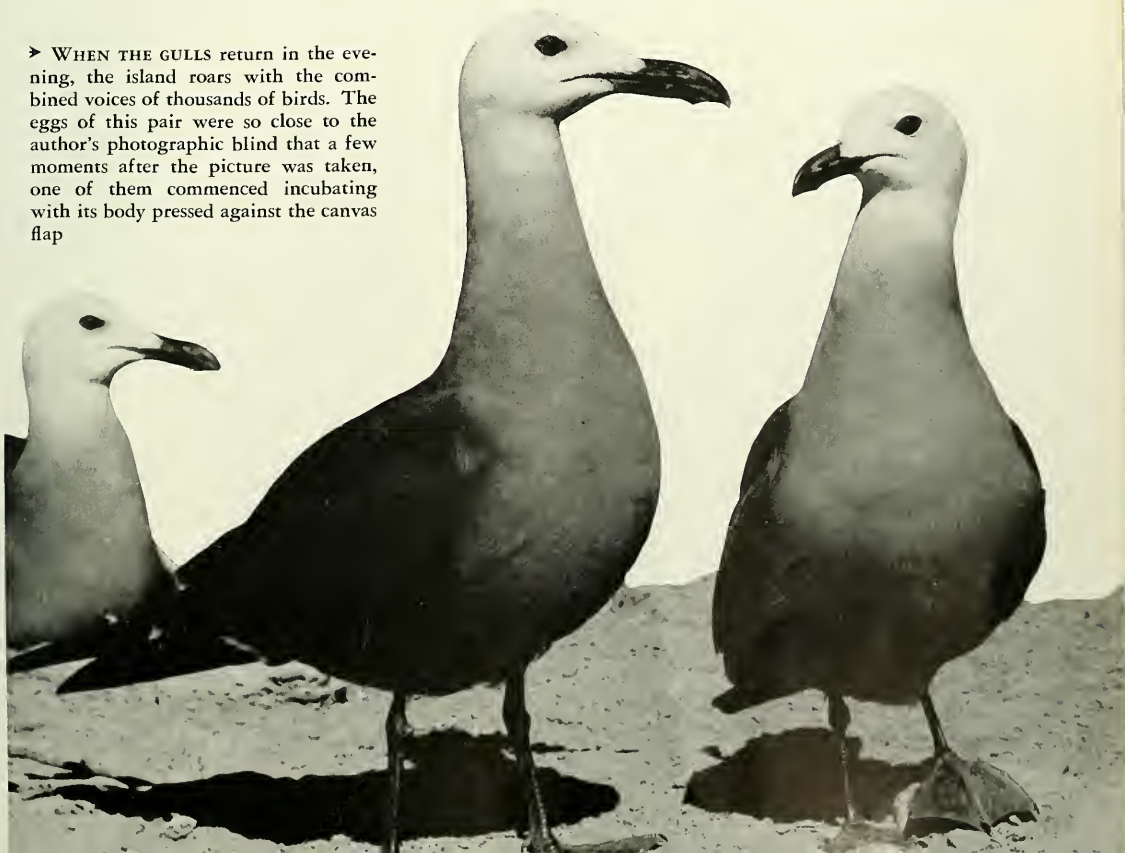
body of water as large and accessible as the Gulf of California has been so little visited.

From the delta of the Colorado to the imposing rocks of Cape San

Lucas—800 miles in all—tiny islands may be kept almost constantly in sight by the traveling boatman. Each of these bits of land has its own population of wildlife, practically untouched and undiminished by the advance of civilization.

Each island crag supports a stick nest ruled by a pair of ospreys. When a naturalist tires of watching their spectacular dives for fish, a slight turn of the head brings into view boobies, pelicans, or man-o'-war birds. And close to these feeding birds, anywhere from one to a half dozen Heermann's Gulls remain alertly on watch. Whenever an osprey dives, the gulls rise and circle above the splash to pounce upon the catch of the fish-

➤ WHEN THE GULLS return in the evening, the island roars with the combined voices of thousands of birds. The eggs of this pair were so close to the author's photographic blind that a few moments after the picture was taken, one of them commenced incubating with its body pressed against the canvas flap





▲ GULLS on top of the blind and gulls all around it. A nonbreeding young one of the previous season, with spotted head and neck, can be seen at lower left. Birds like this one were outcasts and were rarely allowed to remain near a nest. When able, they would systematically go from nest to nest and peck holes in the eggs without eating the contents

▼ THE GULLS FIGHT among themselves whenever one bird oversteps its territorial rights on the crowded nesting ground

Photograph by Robert Meanley

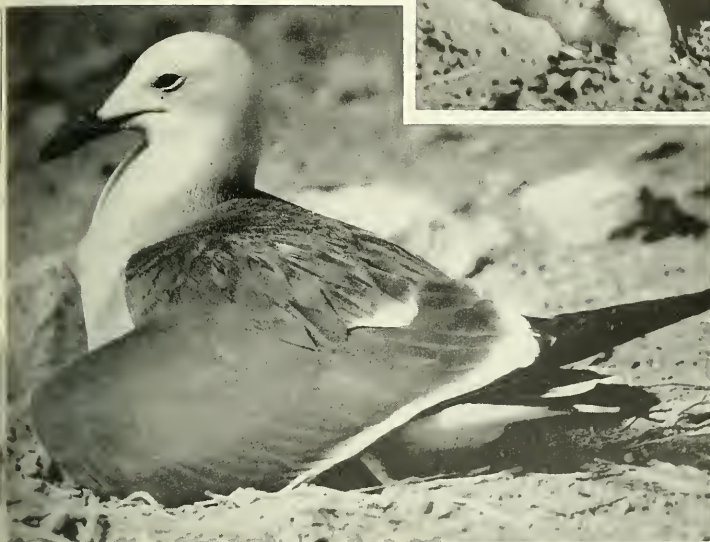
erman as he emerges. If the osprey conceals its newly caught prey, the gulls move off to await another opportunity to steal a meal. But if a struggling fish is held crosswise in the bird's bill, a raucous tug of war ensues. Even when small fishes are readily available, the Heermann's Gulls forget their own capabilities as hunters and prefer to shoplift from others.

On any forenoon during April, May, and June, the Heermann's Gulls blanket an area of the Gulf about 200 miles long, with Isla Raza at the center. They travel in bands of from 2 to 50 birds, and their focal points are the colony sites of pelicans, cormorants, and boobies. A few hours before dusk, however, the vagrant population diminishes as these birds that radiated from Raza at dawn start back to their tiny island home. Working toward this hub, singles converge with pairs, then with scores, and finally hundreds, until from an anchored boat the influx of birds makes Raza's coastline resemble a hive of swarming bees.



► SOMETIMES a bird would return with a small amount of food concealed in its beak. But usually the food for the young was carried within the body and brought up with a pumping motion. The Heermann's Gulls were highway robbers. An osprey, though a much larger bird, could not emerge from the sea with a fish in its beak without being subjected to a tug of war in the air

▼ IN MANY days of continuous watching from the blind, the author never saw one of the incubating birds completely asleep. Some would shut one eye for half a minute or more and then open it and shut the other



As each returning bird drops to a waiting mate on their chosen plot of ground, the beaks open and gull-talk pours out. The sounds and scenes of home-coming are everywhere, and the island roars with the combined vocal utterances of thousands of birds.

Each sweeping wing lowered toward the ground swirls a small cloud of dust. The dust raised by a single bird is insignificant, but across the mile-square island every foot of ground has its agitator, each contributing its share to the yellow plume of haze that marks from a distance this home of the Heermann's.

Aside from a few depressions

that are occasionally flooded at high tide, every spot that could possibly accommodate a nest is utilized, and the nests are spaced about two feet apart. This distance seems to be just right. It permits sparring without interruption of incubation and with only a modicum of damage.

During most of the daylight hours, the nest is tended by only one adult, but occasionally the other partner may be seen sharing some of the duties. Family chores are performed only under difficulties as the territory is crowded, and every time the extra bird moves more than a few inches from its incubating mate, the bill of an-

other setting gull forces battle. Every time the "outside" bird moves around, a brand new adversary, fresh and willing, attacks from the new direction. Hence on flat ground, these couples rarely stay together for more than a few minutes. However, when the nest has a rock or bush near by that affords the protection of elevation, both of the birds not infrequently remain in attendance.

Diligent search about mid-April will usually locate a few chicks hatched by the gulls that nested early on Raza. These young seek the shade of rocks or bushes immediately after hatching and crouch there, blending with the ground, awaiting food from the parents. Thus, if the eggs of several adjoining nests hatch simultaneously, a bare plot of ground is left unguarded. This situation sometimes permits the mixed colonies of Royal and Elegant Terns to establish a nesting foothold.

If one of these vacated spots is selected by the terns, a milling mass circles constantly above, and occasionally an individual nervously alights in the clearing. As more screeching birds fill the air, more drop to the ground; and within a few hours their bodies completely blanket the earth. Terns

on the outskirts of the packed ring are pushed and shoved by those within and forced into fights with Heermann's Gulls that are trying to save their nests.

This battle of attrition continues throughout the daylight hours and probably throughout the night, with the nesting gulls destined to be evicted. By morning, tern eggs at eight-inch intervals dot the chosen plot, and by sheer numbers the new colony continues to encroach into more occupied gull territory.

Until the laying of the first tern eggs, border gulls have to fight their own battles against superior numbers without help from others of their own kind. But now things are changed. Tern eggs are also gull food. Selfishly inclined rein-

forcements flock to the area and patrol just out of reach of the nesting newcomers. An egg left uncovered for an instant is devoured by a waiting Heermann's Gull, and by nightfall only a handful of last night's eggs remain. The next morning brings a new crop, several times the original number; but even though the raids of patrolling gulls make inroads, it is evident that the pulsating colony is gaining a permanent foothold. Three weeks later this shimmering blanket of birds covers an acre or more, and eggs in the exact center commence to hatch. Each day thereafter, concentric rings of new young hatch out progressively farther from the center of the colony.

Any estimate of the number of

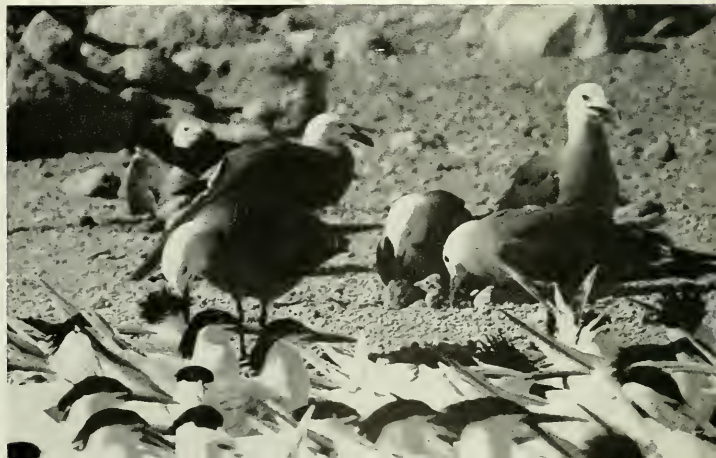
eggs laid by the terns and utilized by the waiting Heermann's would run into the tens of thousands. During the nesting season of the terns, a major part of the gulls' diet consists of these eggs and, later, of young hatched from eggs that survived. The final chapter of this annual battle of Raza places the terns in another predicament, this time one that is hopeless. The original pioneers in the exact center of the colony eventually complete their home duties and, in vacating, leave an expanding bull's-eye of bare terrain. Gulls flock to this unprotected clearing and wage simultaneous attacks from without and within. The tern colony assumes the shape of a doughnut, then a bicycle tire, and finally fades into oblivion in a disappearing act so rapid that its original formation seems slow by comparison.

With the termination of family duties, the Heermann's Gulls scatter. A few wander southward and, imbued with an instinct of migration, spend the winter off Central America. The majority, however, on reaching Cape San Lucas, swing a bit to the west and then north in a leisurely manner until they reach our bays and inlets. Off California, their demeanor while riding the swells beyond the breaker line seems to be the epitome of contentment, giving no hint that, owing to their place in the scheme of things, some people—and certainly the ospreys and terns—would call them villains.



▲ TERNS established nesting colonies in competition with the gulls. As soon as the terns laid their eggs, the gulls kept steady lookout for opportunities to steal them

➤ HERE THE TERN COLONY is gradually spreading by the power of superior numbers and taking over an area used by the gulls. Overnight, the terns may fill a weak spot in the gull territory with eggs laid at eight-inch intervals. These gulls are picketing the terns in the foreground, ready to steal their eggs. Thus the battle between the gulls and the terns rages through the spring in the Gulf of California



resembling elongated canteloupes with thick ridged rind, weigh about a pound each; but most of the weight is in the rind. The pulp inside is eaten by the natives as a sort of jell; and in the pulp the 5 rows of seeds are embedded 20 to 50 in a pod.

Taste a fresh new seed. It looks a little like a pointless almond, has a bitter taste, not the least chocolaty.

The beans sweat, usually in bins, till brown and till the wet pulp runs out as a liquid from below. During this process, a chemical change takes place in which much of the bitter principle is removed and in its place is found an essential oil that gives the cacao bean its characteristic odor. The beans must be spread out to dry—preferably in the sun—on bamboo mats on the Gold Coast, in drying rooms in Ceylon and Grenada, in drying machines in Costa Rica. Cleaning comes next; then grading, bagging, shipping.

Even a twelve-year-old tree, dangling a dozen bright orange or red-streaked pods, yields scarcely 40 ounces of dried cacao beans a year. All the dried beans of one pod weigh scarcely two ounces. It takes about 400 dried beans to make one pound.

Pure chocolate as we know it could be a rare, treasurable thing. Actually, a constant stream of the beans flows into American ports.

During the week of May 14, 1952, steamships from the Cameroons, the Ivory Coast, Accra, Guayaquil, Trinidad, São Thomé, Venezuela, Santo Domingo, Brazil, Panama, unloaded a total of 50,481 bags of cacao beans in New York, while steamships from Accra and Lagos were unloading 32,000 bags in Boston. At the same time, three steamers were afloat to the United States from Africa with 169,600 bags of beans; and from Brazil there was one steamer with 4500 bags of beans. At the same time, seven steamers in Africa were just loading up!

Yes, it is a steady stream. Figures above are from the daily market report of the New York Cocoa Exchange, Inc. Now in its twenty-seventh year, the Cocoa Exchange facilitates the financing, importing, storing, and distributing of cocoa crops, attracts into the United States about two-thirds of the world's supply, and builds up surpluses to export to other countries. However, the foreign markets from which we buy are more or less controlled, and hence they are unfavorable to us.

The United States will use an estimated 700,000,000 pounds of cocoa beans during the coming year. Increased calls for chocolate plus higher bean prices have stimulated new plantings in West Africa and South America and called for better control of diseases of cacao. These diseases now keep production below demand.

Dealers buy cocoa from the producing countries, import and sell it to chocolate manufacturers through brokers and also on the Cocoa Exchange. The manufacturers carry through with the roasting, grinding, blending.

Beans are roasted in drums over a low, steady fire till a rich even brown. At last they give off the delicate chocolate aroma. Crush one in your hand. It tastes as well as smells like chocolate.

Stripped of their thin papery skin, beans are then shattered into fragments—"nibs"—and crushed between grinding stones. This grinding arouses heat, causes the natural cocoa butter to melt. Result is a flowing dark richness—"chocolate liquor." This, rubbed till mellow fine and smooth, is molded and solidified into pure rich chocolate—"bitter chocolate" for cooking.

The same brown mass under hydraulic pressure releases cocoa butter in a pale yellow stream. Then the dry brown residue, finely pulverized and sifted, becomes "cocoa" for bakery, restaurant, home.

Thus cocoa is chocolate with the

cocoa butter removed, then finely powdered. Chocolate is cocoa with all or almost all the cocoa butter left in.

Chocolate plus finely powdered sugar and extra cocoa butter makes "sweet chocolate." Chocolate reduced to a cream, plus sugar, fresh whole milk, flavoring, and more cocoa butter, makes the pure eating delicacy known as "milk chocolate."

Cocoa butter, a firm white solid, pleasant to taste and not easily turning rancid, enters into the making of many confections and is used in place of butter. It is also utilized surgically; and in France it helps make soaps, pomades, complexion creams. Chapped hands and lips like its soothing touch.

Manufacturers offer more than 50 chocolate and cocoa substances to bakers and confectioners. Chocolate, the great flavor, second only to vanilla in world choice, stimulates an endless search for even more intriguing ways to tempt chocolate lovers. Experiments go on spiritedly in chocolate kitchens. Confectioners concoct new delicacies to add to the already royal list of choice chocolate recipes.

"Just give me a cake of chocolate in the middle of the afternoon," trumpets an office worker, "and I'm pepped up till five!" Concentrated calories and energy! Of the whole cocoa bean, 55 per cent is butter, 22 per cent is starch and gum, 17 per cent gluten and albumen. You assimilate nine-tenths of the chocolate you eat. Rightly, chocolate is slogened, "More sustaining than meat."

In time, spacemen a thousand miles up at rocket-ship speed, while sorting their equipment, may call out in airless soundlessness through one walkie-talkie, "Time out for a bite of chocolate!" For chocolate connects things past and present with things to come—burning tropics with interstellar cold.

The elegant chocolate tree fringing the equator helped to mold the Aztec civilization, and it dares to plan for the moon and far, far beyond.



▲ THE LION HUNT in "Bwana Devil."
A United Artists production

▼ ROBERT STACK and Barbara Britton
star in the three-dimensional film
"Bwana Devil"



Bwana Devil

WE set out to see the African film "Bwana Devil" with a great deal of enthusiasm, because none of us on NATURAL HISTORY had ever seen the new three-dimensional movies. Dr. James P. Chapin, our African film reviewer, made us even more eager to see the movie when he told us a story about Colonel Patterson and his book *The Man Eaters of Tsavo*, on which "Bwana Devil" is based.

"Early in 1926," said Dr. Chapin, "Frank P. Mathews and I were in a train on the way from Toulon to Marseille, there to take ship for Mombasa. At one window of the compartment sat a ruddy-faced man wearing just the kind of cap an Englishman would wear on a long trip by train. For a long time he took no part in the animated conversation our other traveling companions were carrying on about the Far East.

"At length, however, he turned to me and asked where we were going. 'To East Africa,' I told him. 'Oh,' said the Englishman, 'I helped lay out the town of

Nairobi.' I pricked up my ears, for I had learned a lot of the history of East Africa from Herbert Lang, Carl Akeley, and other friends. What I said next I do not recall, but presently my new acquaintance said: 'When I was laying the masonry for the Tsavo River bridge. . . ' There I interrupted him. 'You must be Colonel Patterson!' He was!"

Dr. Chapin then explained to us that Colonel Patterson's book is a classic and that it should prove an admirable basis on which to construct a motion picture. The building of a railroad in that part of Africa was a difficult engineering feat at best. Add to this an unusual "epidemic" of attacks by lions, and you surely have an episode from history that is full of drama and colorful scenic possibilities.

But we did not feel that the film lived up to these expectations.

As we walked into the theater we were all handed some cardboard polaroid glasses. Dr. Chapin's review follows:

"Three-dimensional films have long been going through an experimental stage, and now the time has come when they

should give real joy and satisfaction. To do this involves two prime requisites. The story should be worth while, and the audience should be able to watch the screen with visual comfort.

"There cannot be the slightest doubt but that Colonel Patterson's book was the basis for "Bwana Devil." But any similarity or semblance of reality ends right there. How one man could build a Uganda Railway, even with the help of a hundred gaily clad Indian laborers, why he should take a shovel in his own hands to dig a right of way up a steep hill, why he should club a dying lion with the stock of his precious rifle, and why the story ends in a clinch with his wife, giving no clue as to how the railway building was ever to go on, these questions remain unanswered.

"One is led to wonder how much or little of this film was ever exposed in Africa. Most of it shrieks of California and of farm-bred lions. Perhaps I'm wrong, but only a few short strips of crocodiles and hippos look as though they must have been made in Uganda or the Belgian Congo. The Masai in the film neither

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES



◀ DRILLING a hole with a pump drill, instead of the usual bow drill. From Disney's "The Alaskan Eskimo"

▲ THE ESKIMOS are a happy people. Here we see them playing "blanket tossing"—one of their favorite pastimes

▼ A SCENE from "Seminole," a Universal Pictures production

look nor behave like the real article. Some Swahili is spoken, to be sure, but there are teachers of that useful tongue now in the United States.

"The most convincing incident in three dimensions involves the throwing of a long thin spear toward the camera; it made me wince. The cameras, I believe, behaved splendidly all through the film. It must have been the polaroid spectacles that were very inadequate; I found myself trying to readjust them almost all the time to see the screen more clearly. The screen in my opinion should have been bigger. What with the eye-strain and the silliness of its plot, *Bwana* proved a sad disappointment."

Wearily we rode back to the Museum. Dr. Chapin looked anxious to get back to the *real Africa*, where he is going around the middle of this month.

This effort should not prejudice us against the numerous three-dimensional films now being prepared for the public by all the major motion picture companies. It is a case where the horse that crossed the line first at the races may not get the blue ribbon at the show.

The Alaskan Eskimo

WALT DISNEY perfected the animated cartoon through several decades and achieved such artistry that some of our most illustrious universities bestowed honorary degrees on him. All this in the world of fantasy.

Recently he has sought truth in another medium—in the lives of animals.

And now in "The Alaskan Eskimo" we have the first in a planned series on man himself—what we dare hope will be a truly documentary portrayal of peoples whose lives are different from our own.

Our reviewer, Junius Bird, a man familiar with the arctic from many expeditions, writes as follows:

"Disney's film on the lives and customs of the Alaskan Eskimo will be found en-



Brief comments on films previously reviewed

Documentary and Grade A

Bear Country

A Disney True-Life Adventure

Ivory Hunter

One man's struggle to build an African Wildlife Park

Down the Alphabet

City Beneath the Sea

Tenuously based on Port Royal, Jamaica, earthquake, 1692

Hiacwatha

A very free interpretation of Longfellow's poem

The Snows of Kilimanjaro

Story of a writer with a complicated personality

What the Experts Said

Interest, drama, and continuity with a sound overall plan

Authentic geographically. Marvelous shots of majestic animals. Good conservation

A science fiction portrayal of underwater exploration. Little natural history

Good in that it departs from stereotype portrayal of Indian. Not outstanding artistically, dramatically, or scientifically

Some splendid African animal shots. Camp scenes unconvincing

joyable. It is straight reporting, with no attempt to fit the subject to preconceived ideas. He has taken a single Eskimo community, unidentified, where something of the old way of life survives, and recorded seasonal activities in their normal course. There is no attempt to hide the evidence of acculturation and change, though one may doubt that the Eskimos are using such an outdated mail order catalogue. Activities covered include housebuilding, the making of an umiak, the use of the kayak, fishing, preparation of food, sledging, ivory carving, and the games and dances they have for amusement. Though it may not satisfy an anthropologist's desire for detail and might have profited from better professional advice, it is worth seeing and represents a lot of hard, skillful work on the part of the photographers."

Seminole

"SEMINOLE," produced by Universal Pictures, is here reviewed by Ethel Cutler Freeman of the American Museum's Department of Anthropology. Mrs. Freeman is currently studying the Seminoles at the Big Cypress Seminole Indian Reservation in La Belle, Florida. She comments:

"Applause for Howard Christie, the producer of an unpretentious but new type of Indian picture, for he has broken

away from a worn-out pattern. For the last 20 years 'savages' have whooped, danced, and chased their enemies while the noble chief looked on as stoic as a cigar-store Indian.

"Seminole" is not only a story of the Second Seminole War but also that of the conflicting ideologies of three men—Osceola, the Seminole chief; a sentimental white Lientenant who was Osceola's childhood friend; and a disciplinarian, a West Point Major.

"The producer's claim that 'Seminole' depicts history accurately is false. Every school child knows that Osceola and his tribesmen were taken under a flag of truce and thrown into prison on the order of General Jessup, who had been under strong pressure to rid Florida of the Seminoles. Records prove that Osceola died of quinsy in Ft. Moultrie, South Carolina, instead of being thrown into a pit and stabbed, as in the movie version.

"In the movie, Osceola is shown as a benign, friendly individual, who loves all humanity. The truth is much more dramatic. He was a hot-headed dynamic leader. His hatred of whites flared into action when unscrupulous slave raiders carried off his wife, claiming unjustly that she was a fugitive slave. He wrote General Clinch, 'You have guns, so have we. You have powder and lead, and so have we. Your men will fight, and so will ours

till the last drop of Seminole blood moistens the dust of his hunting ground.'

"A sequence of shots of the scouting party attacking a Seminole village gives the true feel of swamps. The rest of the photography is harsh, the color strident and flat. And South Florida is much more varied and exciting topographically than the country shown in this film.

"Quicksand is often called ball-bearing sand in Florida, for it rolls away from under you and is dangerous. But I never saw or heard of quicksand so watery that even with the aid of a rope, one could dive into it and come up again with a man who had gone down, as the Lientenant did in 'Seminole.'

"My criticisms are minor in comparison with my pleasure in finding an Indian picture where the action interprets a constructive idea. We praise 'Seminole' as a step in the right direction. But a historical documentary would have encouraged us to recommend it without qualification to schools. Then besides regular audiences, the box offices would be flooded with requests from teachers for seats for their pupils.

"This period of Florida history is full of drama, suspense, and human interest, and with the conflict of ideologies that are still an issue in the world today. Let us hope that 'Seminole' will be a forerunner of a new trend in Indian pictures."

BOOKS *Continued from page 151*

author has focused attention on the older individuals. In a completely personal and informal manner he recounts his conversations with these people, retells their stories, and in various ways gives us an impression of how they feel and think. Included in the book also is a magnificent series of reproductions in full color of photographic portraits of Hopi individuals, principally of those venerable ones aged 70-100 years.

To go to the older people for the fullest view of native life is a technique commonly employed by the ethnologist, but this

is in no sense a scientific study of the Hopi. It is somewhat thin going for an anthropologist who is well aware of the fact that native peoples like the Hopi have patterns of attitudes toward life and nature that differ from ours—and they might be quite admirable ones too. For the layman, however, and for any lover of our Southwest the book could prove to be a valuable experience.

G. F. EKHOLOM

PORTRAIT OF THE OLD WEST

----- by Harold McCracken

McGraw-Hill Co., Inc., \$10.00
232 pp., 88 illus. (including 39 in color).
43 figs.

IN recent years we have seen an increasing interest in the history of the West. Reminiscences and old journals, long forgotten, have been following one another off the presses. Historians, like Bernard de Voto, have re-examined old

sources of information and opened new ones to give us fresh interpretations of the factors underlying the occupation and settlement of the vast area west of the Mississippi. Even the artists of what we are calling the "unspoiled" west are also coming into their own after a long period of neglect. Such notable portrayers as Catlin and Miller have been given rather full treatment and others will no doubt be added.

In this book Mr. McCracken has brought together all the more noteworthy of the painters and illustrators of the landscape and life of the West. Although he makes a bow toward Le Moine and John White, the first to paint the life of what is now the United States, his collection really begins with Seymour's pioneer painting in 1819 and ends with Remington who closed the nineteenth century. In between are such figures, to name only a few, as Catlin, Miller, Bodmer, Bierstadt, Eastman, and Russell. Each artist is introduced with a thumbnail sketch of his career and an outline of his work dealing with the West. The illustrations are abundant, consisting of both color plates and black-and-white reproductions.

The total effect is striking and from these documentary records we derive a more vivid picture of life of the Old West than words can ever convey.

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standing long after the cobra has struck or the bird has toppled from the perch or the sphinx's head has been lopped off by the two-edged sword—Kansas wind and floods. So I think it only right that pictures, at least, should be kept in our archives.

H. E. PRENTICE

Johnson, Kans.

We had been hoping that someone would show our readers the Sphinx—Ed.

Another Meat-eating Plant

SIRS:

When I saw Mildred J. Ericson's article on "The Baleful Cobra Plant" in your March issue, I was reminded of another "bug-eating" plant, which I photographed last summer near Southport, North Carolina (see adjacent picture). I had stopped off to renew acquaintances with my old friends the amazing Venus's-flytraps (*Dionaea muscipula*), which dot the sandy pine savannas of the coastal plain in that region. Imagine my surprise upon noting that one of the traps had apparently just closed on an oversized mouthful, a lush-green katydid. The insect was still alive and at least for the moment seemed content to hide its head, ostrich-fashion, in the jaws of the trap.

I doubt very much whether the Fly-trap could have held its prey indefinitely, but to make certain that the katydid would escape, I released it.

WALTER H. HODGE

Silver Spring, Md.

SIRS:

. . . I read your magazine every month, and it offers hours of enjoyment. Many of the articles are excellent for reference. Please don't change it; your selection of subjects is most excellent.

Thank you.

JAMES LANGHAMMER

Indianapolis, Ind.

SIRS:

We have greatly admired the beautiful picture of mushrooms on the February cover of NATURAL HISTORY Magazine by Helen Cruickshank.

Will you convey to her our sincere congratulations on the beauty of this remarkable picture?

ANDREW SINION

Towson, Md.

SIRS:

. . . I should like to express deep appreciation to you and your staff for the excellent work you put into NATURAL HISTORY to make it my favorite magazine.

DR. WALTER KOCHOLATY

Elizabethtown, Ky.



Fourth Archbold Expedition to New Guinea Sets Out

The Fourth Archbold Expedition to New Guinea, composed of a botanist, a zoologist, and a mammalogist, will spend nine months of 1953 in the Papua area of eastern New Guinea making the first comprehensive survey of the plant and animal life of the region.

The three-man scientific team, whose work is sponsored by Richard Archbold, Research Associate of the American Museum of Natural History, will be led by botanist Leonard J. Brass, of the Archbold Biological Station in Lake Placid, Florida. He will be accompanied by zoologist Geoffrey M. Tate, who is in charge of the Archbold Expeditions' New York headquarters at the American Museum, and Hobart M. Van Deusen, a member of the Museum's Department of Mammals.

The scientists plan to make extensive collections of plants, mammals, amphibians, fresh-water fishes, reptiles, and insects from the eastern end of New Guinea and the adjacent D'Entrecasteaux Islands. The results of their survey will thus supplement those of earlier Archbold Expeditions to this part of the world; three to other sections of New Guinea and one to the Cape York Peninsula of Australia. The aim of all has been to study the relationships among the plants and animals of New Guinea, Malaysia, and Australia. The Army Medical Service will also benefit from the expedition because parasites of both humans and other warm-blooded animals will be collected and turned over to them for research purposes.

Mr. Brass, who alone has participated

in all four earlier Expeditions, knows from experience the problems involved in spending a long period of time in a remote area. With the exception of food, which will be replenished about once a month, every need, both personal and scientific, must be anticipated before the group gets into the field, he pointed out. Two tons of supplies and equipment were shipped ahead last December, all packed in special light-weight, moisture-proof boxes which will be used on the return trip to carry the specimens brought back by the expedition. Each box is carefully planned to hold about 40 pounds, the average load a native carrier can handle.

Because the terrain is very rough, each man must take three pairs of heavy boots, two of which will undoubtedly be cut to ribbons by the end of their nine months, Mr. Brass stated. The vitamin pills and anti-malarials, Mr. Brass went on, will be kept on the table beside the salt and pepper, so that the scientists will surely remember to take them. Five thousand strings had to be attached by hand to 5000 labels before departure for marking the specimens secured in the field.

A foreman and ten natives will form the permanent staff of the expedition's camp, and as many as fifty natives will work for the scientists from time to time. A government regulation requires that expeditions outfit each native employed with a blanket, a bowl, a lava lava (loincloth), a mosquito net, a pannikin and spoon.

Arriving in New Guinea toward the end of the rainy season, the group will start their survey in a semiarid coastal area. When the dry season arrives, they

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will begin working their way up through rain forests, into the alpine grasslands. "Once we hit the mountain area," Mr. Brass pointed out, "it rains almost daily for short periods of time, whatever the season."

The three earlier Archbold Expeditions in this part of the world were each notable. The 1938-1939 expedition to the Snow Mountains area in New Guinea discovered and explored the "Shangri-la" valley of the Balim River. It was from this area, seven years later, that three members of the U. S. armed forces, isolated there after a plane crash, were removed in a spectacular glider rescue operation. On the 1936-1937 expedition to the Fly River area, the scientists lost their plane and were forced to build rafts and float down hundreds of miles of river to a point where boats could navigate and thus pick them up. And in 1933-1934, in the Wharton Range in central New Guinea, the expedition reached the summit of Mt. Albert Edward and was the first to give this area a protracted scientific study. The 1948 expedition to the Cape York Peninsula was the first major American expedition to that remote area.

In addition to Richard Archbold and The American Museum of Natural History, the Arnold Arboretum of Harvard and the Office of Naval Research are sponsoring the 1953 expedition.

To Study Nigerian Fish

A nine-month expedition to Nigeria for the purpose of studying the reproductive behavior and ecology of the West African mouthbreeder in its natural habitat is being undertaken by Dr. Lester R. Aronson, Chairman of the Department of Animal Behavior of The American Museum of Natural History.

Dr. Aronson will carry out this work on a Fulbright Research Scholarship. Accompanied by his wife and two small children, he will make his headquarters in Ibadan, Nigeria, where he will be the guest of the University College, the Nigerian branch of the University of

London. The American Museum is providing equipment for the trip, including seines, a Land Rover, a small car similar to our jeep, and a Klepper fold-boat in which Dr. Aronson plans to follow the fish up rivers to ascertain how far inland the Tilapia breeds. Dr. Aronson is also equipped with a motion picture and two 35 mm. still cameras and hopes to bring back pictures showing the native habitats of these interesting fishes.

Very little was known about the West African mouthbreeder, Dr. Aronson told us, until fifteen years ago when the study of this species, *Tilapia macrocephala*, was begun in the laboratories of the Museum's Department of Animal Behavior. Now, in his forthcoming trip to Nigeria, Dr. Aronson expects to correlate some of the data yielded during fifteen years of study on Tilapia in the laboratory with findings on Tilapia in its natural environment.

Plans for a New Hall of Biology of Man

A gift of securities valued at approximately \$95,000 from John D. Rockefeller, 3rd, will enable The American Museum of Natural History to begin work on a unique series of exhibition halls devoted to the study of man. Mr. Rockefeller is a Trustee of the American Museum, and his gift will make possible the preparation of a Hall of the Biology of Man, the first in a series of five to be devoted to the study of man. The new hall will mark the initial step in giving a comprehensive, three-dimensional interpretation to modern anthropological research, which views man as an integral part of the world around him rather than as something separate and isolated from his environment.

"The importance of this series of halls, which will be the only one of its kind in existence, cannot be stressed too much," said Dr. Parr, the Museum's Director. "For it means that at last we shall be able to share with the public a great body of knowledge about man, his origins, and his culture which, for lack of funds, has remained in the hands of scholars alone. Mr. Rockefeller's gift is making it possible for us to take the first step toward disseminating this knowledge."

The plan of the halls was conceived by Dr. Harry L. Shapiro of the Museum's Department of Anthropology and will be carried out under his supervision. The first one will be concerned with human evolution and biology and the relation of man to his environment, including the effect of nutrition, the mobilization of the organism against disease and the vectors of disease. The later halls will deal with man's behavior, social organization and cultural history, with the fifth hall to be devoted specifically to American culture.

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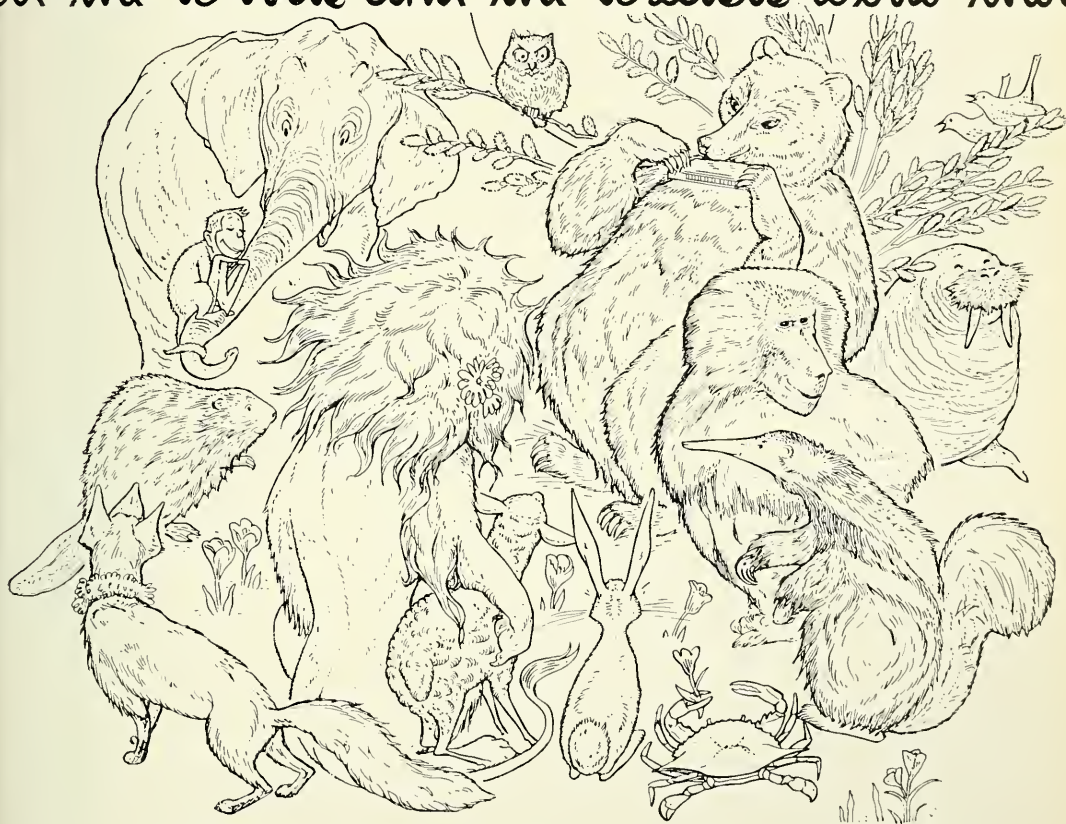
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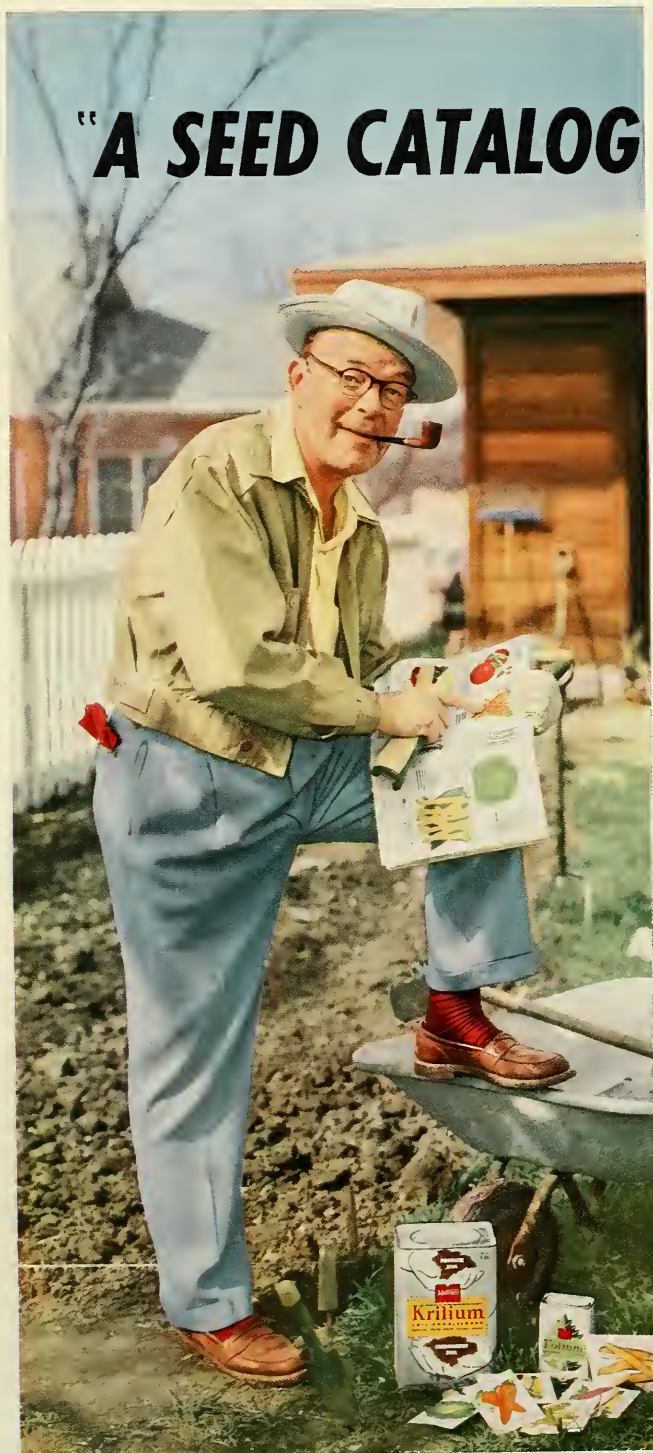
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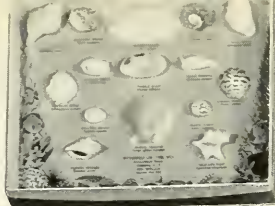
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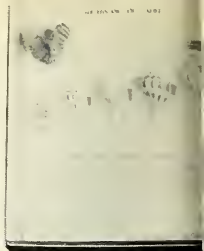
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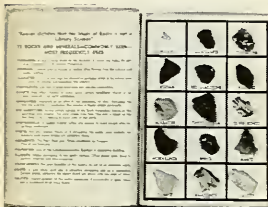


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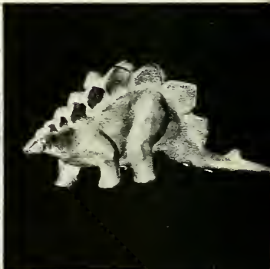
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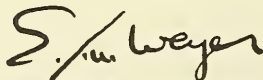
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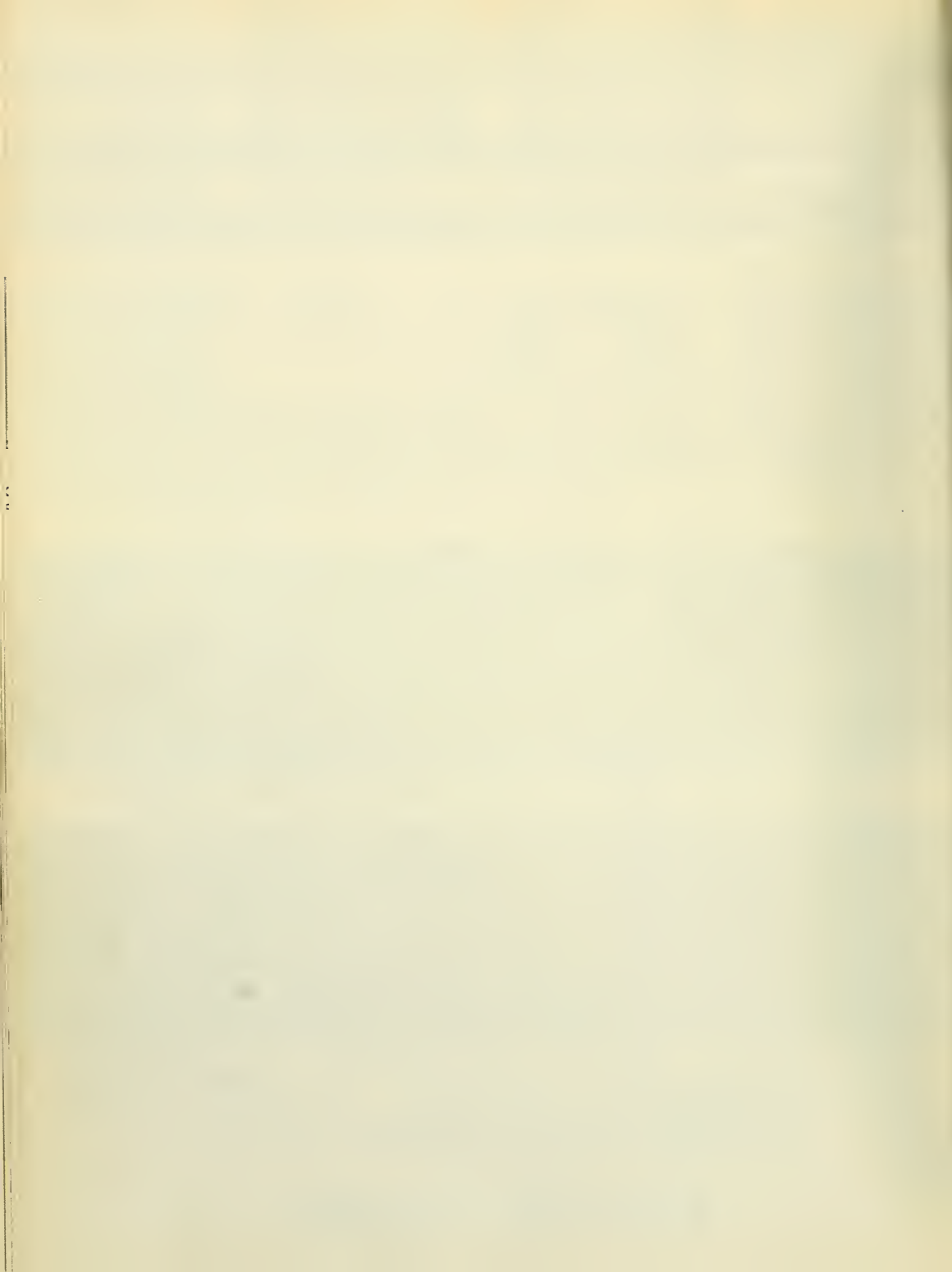
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LETTERS

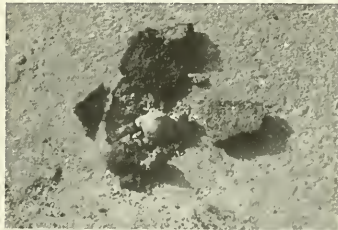
Powerful Mushrooms

SIRS:

How powerful are the forces of growth? We are all familiar with the ease with which slow-growing woody tree roots can split boulders, dislodge rocky ledges, crumble walls, lift concrete and flagstone walks, penetrate pipes, and the like. Who would suspect that anything so soft and "mushy" as a mushroom could break through an asphalt pavement?

I was nature-rambling along a path in Pelham Bay Park within the confines of greater New York recently when my eye was caught by the spectacle portrayed in the accompanying photographs. This unusual upthrust in the asphalt puzzled me for a moment. I thought of moles, mice, and insects, as my mind searched for a possible explanation. In all, there were several of the protuberant mounds. In a few seconds, the mystery was solved. Mushrooms had

Continued on page 236





Life of the Past

By
GEORGE GAYLORD SIMPSON

A nontechnical, but not condescending, discussion of the whole scope and significance of paleontology as a science, stressing the principles and interpretation of the history of life—for both the student and the general reader

An outstanding paleontologist—author of *The Meaning of Evolution*—explains his science here for the general reader and the beginning student alike. Paleontology, or the science of reading the record of life, has made rapid progress in recent years; and with its links to other branches of knowledge ranging from geology and biology to archaeology and history, has growing import and fascination for man. George Simpson explains what the “historians of life” do: how the history of living things is preserved, discovered, and interpreted; what major historical and biological principles have been deciphered from fossilized clues; and how these principles fit into our understanding of life and its evolution.

He introduces the reader to a world around him, full of the shells and bones of a multitude of organisms amassed

through geologic time, of whose presence as well as meaning he may have been unaware. He describes the changes in world geography that can be read from the earth, as well as the nature and significance of the evolution of plants and animals that the earth has recorded. The classification of the main groups of plants and animals is given briefly in an appendix, with summaries of what is known of their history.

George Gaylord Simpson is Curator of Fossil Mammals and Birds in the American Museum of Natural History in New York and Professor of Vertebrate Paleontology at Columbia University. In addition to *The Meaning of Evolution*, published in 1949, he is the author of *Horses, Tempo and Mode in Evolution*, and other works on mammals.

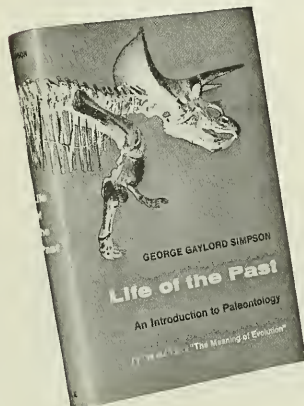


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LIFE OF THE PAST

— by George Gaylord Simpson

Yale Univ. Press, \$4.00
198 pp., 48 illus.

THE term "fossil" is sometimes applied to individuals alleged to be dead from the neck up. In this book, however, Dr. Simpson quickly convinces his readers that fossils are to be regarded only as aspects of life, and that "nothing is more lively than the study of the dead remains of ancient life." This point of view, together with the clear, simple, and almost chatty, text, make his book one of the most readable and illuminating of all works dealing with paleontology.

"The greatest contribution of paleontology to the understanding of evolution," writes Dr. Simpson, "is that it permits us to see what we cannot see in living organisms." A bed of fossil remains of a single species, for example, may form a continuum of individuals that differ very markedly between the lower, and older, and the upper, and younger, levels. The two extremes, of course, did not exist together in time as living forms; populations showing equal discrepancy in our contemporary world would be regarded as distinct species because of the absence of the "missing links." This item is from the chapter on the diversity of life, which offers the best of all popular statements on the significance of "species" as a term applying to populations rather than to individual organisms.

Ecology, which Simpson defines as "the study of togetherness," might seem difficult of application to plants, animals, habitats, and climates millions or hundreds of millions of years in the past. To the author, however, this relatively young branch of biological science fits well into the paleontological picture. As an instance of early reptilian or "cold-

blooded" experiments in the control of body temperature, he cites Romer's explanation of the strange structure on the back of the ancient fin-backed land reptiles. This previously inexplicable sail-like protuberance is now believed to have been used as a radiator and heat receptor. Its effectiveness could be adjusted by changing the angle at which the animal stood in relation to the sun—between end-on and broadside.

The familiar biogeographical regions of the earth are, as Simpson points out, static conceptions, being based solely upon manifestations of life as they exist today. When considered historically, they acquire a different but far more fundamental meaning.

Doctor Simpson's strictly nonprofessional pen-sketches illustrate his book. They suggest that many another specialist might better rely upon his own untutored draftsmanship instead of struggling to express his visualizations through the brain and skill of somebody else.

R. C. MURPHY

WANDERLUST

— Hans de Meiss-Teffen
with Victor Rosen

McGraw-Hill, \$4.00
328 pp., 12 illus., 5 maps

HANS DE MEISS-TEFFEN was a clerk in the London branch of the Swiss Bank. Like many other clerks (and the butcher, the baker, and candlestick maker) he dreamed of a life of adventure, spiced with a soupçon of danger. But, unlike most of us, he did something about it and wound up with experiences that will keep arm-chair

pilots and home-to-office navigators glued to their seats until they have finished the exciting log of his travels.

He wanted to go to Africa, so he bought the "Santa Barbara," an old fishing boat, sailed from Brindisi to the island of Syros, picked up with four men who had a 34-foot sailboat and no captain, took them as far as Beirut, made a side trip on land to Damascus, and returned to find that the owners had sold his command from under him. With his share of the proceeds, he bought the "Enchantress," dropped his hook in Haifa, and made his way into Palestine, where he worked at odd jobs until he could afford to sail again. He finally reached Africa, sold the "Enchantress," found himself running a farm for a martinet of a woman in Rhodesia, whom he had to paddle with a piece of board to teach her good manners.

After branching out on his own with a successful jungle hotel, he returned to Europe, where he was picked up by a Nazi agent who had read of his sailing adventures. He was offered a sailboat to go down the African coast, relaying radioed information back to Germany. He tipped off the British, took the job, and then played the dangerous game of *agent double* until his craft was wrecked off the Sierra Leone coast.

The war over, he acquired the "Speranza," a 34-foot sailboat, and became the first to sail a privately-owned vessel out of England since World War II began. His destination was New London, Conn., and he made it in fifty-eight days, eleven days less than the previous record for the east-to-west solo crossing. Since his landing in the United States he has worked for occupation forces in Germany, lectured to women's clubs, and written articles.

Wanderlust will appeal to those of us who would go down to the sea in ships but who have to remain home to push pens and baby perambulators!

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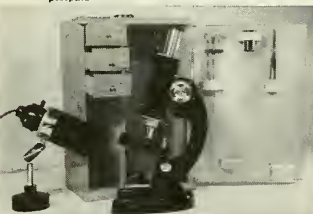
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WATER

by Thomson King

The Macmillan Co., \$3.50, 238 pp.

ALL life is intimately tied to water, and an outstanding characteristic of civilization is man's increasing ability to exploit water in all its forms. It is from such a perspective that Mr. King writes. The first half of his book deals with water in nature. A discussion of its chemistry and physics leads into the geological history of the earth, in which water has played a key role. Succeeding chapters cover such topics as oceans, the water cycle, and weather. Lakes, rivers, and glaciers also come in for mention before the final subject of the section—life and its origins—is reached.

As Mr. King has used the historical approach in describing what we have learned today about water and the natural world about us, man has already appeared in the book. In the second, part man and his many activities that involve the use of water become the topic under discussion. Water in fact touches our lives at so many points that this section tends occasionally to become little more than a thumbnail sketch of certain aspects of world history. Through little "asides," the author carries us into the history of water navigation, naval history, steam engines, and canals. In the closing chapters irrigation, flood control, pollution, and water conservation come in for an all too brief mention.

All but the most casual readers of this book will undoubtedly wish to go on and read more about many of the topics that are touched upon. Undoubtedly this was the author's purpose in writing it, as it covers so much ground that space limitations do not permit a very exhaustive treatment of any topic.

RICHARD H. POUGH

THE POCKET GUIDE TO BRITISH BIRDS

by R. S. R. Fitter

Dodd Mead, \$4.50

240 pp., 112 plates (including 64 in color)

MANY visitors to England in this Coronation Year will be eager to see the skylark, the nightingale, the willow-tit, and other birds celebrated in song and story. This pocket guide is well suited to help them do so. It is practical throughout, and the birds are arranged not by families but according to the areas in which they occur—land, water-side, or on water. Within these groups they are further classified according to size from "very small" to "huge." Even the color plates, where Mr. Richardson has managed to include a

great many figures without undue crowding, are practical in that birds of more or less similar coloration are brought together. The text gives the habits, appearance, and local distribution of each bird, and there are keys in which behavior, call notes, shape of the bill, and other features are used to give additional clues to identification. All in all, this book furnishes a very useful guide to the birds of England, and, for that matter, of Europe.

DEAN AMADON

EXPLORATIONS IN SCIENCE

by Waldemar Kaempffert

Viking Press, \$3.50

320 pp.

WALDEMAR KAEMPFFERT is an experienced writer on science for the lay public and has the capacity for lucid exposition in terms the average man can understand.

In this pretentious book, which touches upon some 20 subjects ranging from nuclear fission and supersonic speed to social changes, cancer, and play, the author condenses the best thought and the most recent advances in neat packages, which give the reader a very good insight into what is going on in this world.

Some of the topics, which call for very careful treatment if the average man is to truly grasp fundamentals, such as the functioning of the atomic bomb, have been discussed with a particularly happy selection from the profound thought that was essential to the exploration.

Current literature abounds in references to scientific advancement, and often the reader is puzzled as to what is fact and what fiction. This book will serve, to some extent, to set limits on what we may expect as these recent discoveries are exploited. One may be surprised to find in Kaempffert's chapter on Artificial Satellites in Space that this is a serious concept well within human capacity and not a Buck Rogers figment of the imagination. But as the story of *Exploration in Science* unfolds, the reader may well decide that the sheer truth exceeds in marvel anything created in fiction. Indeed, a thinking person may be forced to the conclusion that mankind may be too smart for his own good.

The power that came to man when he

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mastered the secret of the atom is capable of an abuse that can make such knowledge a curse rather than a blessing. But man has this urge for exploration, and this pressing forward to new frontiers will go on whether individuals approve or not. It is very convenient at this time to have such a well-balanced report on all the important things in science that are taking place today.

HAROLD E. ANTHONY

ANIMALS AND MAN

----- by G. S. Cansdale

Frederick A. Praeger, \$4.00
200 pp., 55 illus.

EVER since man as a race arrived on earth, he has greatly affected the animal kingdom. In taking possession of countries, he has inevitably dispossessed many of the previous occupants and replaced them by others.

George S. Cansdale has made a most comprehensive study of this subject. His interests are world-wide and take us back to the beginning of history when man lived by hunting and clothed himself in skins, a far cry to the furs worn in fashionable circles today.

Animals, we learn, were of fundamental importance in the growth of civilization and are a vital necessity to human life. *Animals and Man* enters the extensive field of the far-reaching effect of civilization on wildlife and the direct as well as the remote results of the redistribution of animal life. For example, we learn that the intentional devastating damage done by man on wildlife is even surpassed by the accidental or unintentional. Rats and mice introduced into the United States cost us approximately \$200,000,000 annually, and in other countries the figures are equally appalling. The thoughtless release of 24 rabbits in Australia one hundred years ago now costs that country about \$100,000,000 a year; on the other hand, the ladybird beetle, introduced in 1888, is one of California's greatest weapons in insect control. The author elaborates on the extremely numerous and varied animals that are of special service to man. There are more than 40 different kinds of domesticated animals, varying from insects to elephants, that provide him with food and clothing. Some are beasts of burden, some are companions, and others are assistants. Practically the

whole human race walks on leather from animal hides. The amphibians seem to be the only group of backboned animals that do not provide leather for use in some form or other.

George Cansdale has not forgotten the important role animals played in religion, folklore, and superstition. There is also a chapter on animals as carriers of diseases and the wonderful contribution they have made to human health.

Mr. Cansdale spent 14 years as a forester on the Gold Coast and since 1948 has been superintendent of the London Zoo. He writes with authority and has presented his facts with considerable charm and simplicity.

There is a bibliography and a complete index.

G. C. GOODWIN

ANNAPURNA

----- by Maurice Herzog

E. P. Dutton, \$5.00
314 pp., 27 plates (including
3 in color), 8 maps

TO even the most work-a-day of us, the successful scaling of one of the world's highest mountains must be a stirring event. We feel an intangible pride of victory and, at the same time, a pang of sadness as at the death of a valiant enemy.

We need not mourn too much, however, for statistics indicate that virgin summits will long remain to challenge the alpinist. In the Himalayas more than 200 peaks reach over 23,000 feet; fourteen of these are over 26,000. Of the latter only one, Annapurna, the subject of this book, has been scaled.

Maurice Herzog's story is one of teamwork, organization, supply, reconnaissance, assault, victory, and tortured withdrawal. Much of it is a surprisingly wooden play by play account. Midway through the book, however, an emotional atmosphere develops as Herzog comes to grips with his terrible adventure. Then begins a series of appalling accidents and miraculous escapes, followed by indescribable suffering. Forgotten are the shortcomings of the book—the lack of any information pertaining to natural history, geology, etc. Not even a thumbnail sketch as to the origin and culture of the local inhabitants of the high Nepalese valleys is included. It is as though Herzog could see only the mountain. His narrative is set to the cadence of mental and physical suffering. But through this theme run flashes of compassion, pity, and almost childish emotion.

This book will not appeal to those who try to fathom the ethereal drives that so often lead men to accept, nay seek out, insurmountable challenges. To them, talk of the dignity of man and the



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joy of intangible victories will ring hollow as the author hovers on the verge of death, his mind wandering, his feet filled with maggots.

Once attained, the summit is quickly abandoned. The true climax, the race with death, then begins. It is the winning of this race, not the actual scaling of Annapurna, that is the story.

E. THOMAS GILLIARD

OUR ANIMAL NEIGHBORS

- - by Alan and Mary Berry Devoe

McGraw-Hill Book Co., \$3.75
278 pp., 11 illus.

THIS book relates interesting incidents of animal behavior that take place on the Devoe farm of some 125 acres in the Berkshires. This area appears to be a well-diversified association of upland, lowland, forest and stream, and harbors, a goodly assemblage of wildlife ranging from white-footed mice to foxes and deer.

The reader is told something of the antecedents of the Devoes, of their early love of nature and their decision to devote their lives to the study of nature's marvelous manifestations about them. Their farm is a little world in itself and affords the opportunity for almost limitless observations. The episodes described are some of the highlights in their experiences, and it is easy to see how even the day-to-day events can give satisfaction to persons who consider the wild creatures about them members of the one big family in residence.

Considerable autobiography is included in the text, and Devoe takes pains to identify himself and his wife as naturalists; in fact, this characterization is almost too often repeated since the reader readily accepts this designation. Sometimes the digression into personal

Continued on page 238

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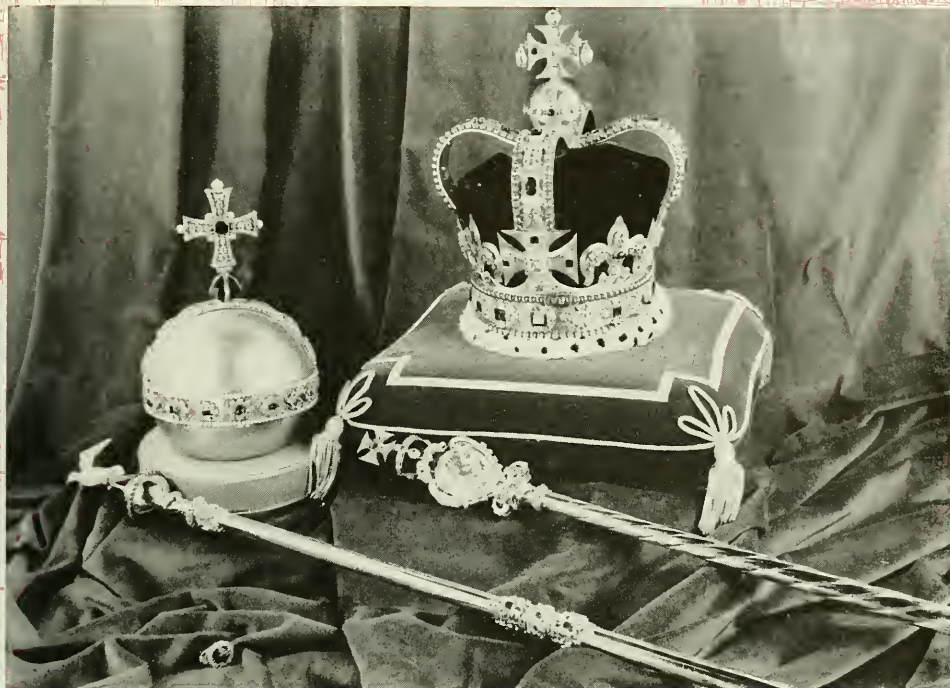
◀ A MINER in South Africa rejoicing over a large diamond in the rock he has just blasted

The

I HAVE never yet stood before that dazzling glass cubicle in the grim gray Tower of London and looked on the jewels of the Crown without an inner salute to those inscrutable forces of nature that were the original source of this fabulous bounty.

The little printed cards will indeed tell you that this priceless diamond was the gift of the Transvaal, that these tear-drops of pearl were bequeathed by a queen, that that bejeweled circlet was presented by an Indian Rajah. But the little cards do not go back far enough. The true giver of these priceless treasures is the original

NATURAL HISTORY, MAY, 1953



Crown copyright photograph

MINED FROM excavations like the "Big Hole" of Kimberly (left), cut and set by the greatest lapida-

ries, the Crown Jewels will leave the Tower of London briefly for Coronation in Westminster Abbey

Coronation Jewels

By Lucy Salamanca

High lights of the coming ceremony will be the biggest
and brightest gems that have ever been wrested from the earth

giver, Nature herself. She it was who, through eons of time, produced them; she it was who relinquished them to man.

And so, circling that barred and glittering cage of glass wherein diamonds and rubies, sapphires and emeralds flash and pearls gleam, and the wealth of an empire is encompassed, I pay my silent homage to the true source of these kingly gifts. I find myself wondering, too, how many heads

upon which these crowns have rested have taken thought amid their temporal splendor that it is to none other than the earth itself that they stand indebted for these most impressive symbols of their majesty.

The coronation ceremony by which England's monarchs are

dedicated to rule their peoples, does, to be sure, take into account a power beyond their own. The magnificent jeweled Sword of State, its hilt encrusted with emeralds and diamonds, its scabbard adorned with the Rose of England, the Thistle of Scotland, the Shamrock of Ireland, formed of rubies and

The photographs of the Crown Regalia illustrating this article bear the British Crown Copyright. Special permission for their use in *NATURAL HISTORY Magazine* was granted by the Controller of Her Majesty's Stationery Office.



WORLD'S LARGEST: The Cullinan Diamond before cutting, reproduced at about actual size, from a replica on display at the American Museum. The gem weighed close to one and a third pounds, or 3106 carats. It was sent to England so the King could see it and was then cut into the nine principle stones shown below and numerous smaller ones. Below: Joseph Asscher cleaving the giant gem

AMNH Photo



emeralds and diamonds, is not retained by the monarch. It is to the Archbishop of Canterbury that Queen Elizabeth the Second will eventually turn it over, to signify that it is at the service of the Church. And it is a jeweled Cross that surmounts the Royal Scepter of England, the ensign of kingly power and justice. Likewise the sovereign's Orb, that gleaming ball of polished gold, studded with emeralds and rubies, pearls and sapphires, is surmounted by the Cross. And the top-most symbol of the scepter that the Queen will hold in her left hand is a white dove that symbolizes the Holy Ghost. There is, it is true, in the regalia, a sharp-pointed Sword of Temporal Justice, but there is a Sword of Spiritual Justice as well. Thus acknowledgment is made, at every step of the significant ritual of the coronation, of the benign, eternal verity that those who are



set by circumstance upon the thrones of nations rule only by the grace and favor of the one truly Royal Will.

And so, looking upon these jewels of the Crown, whose radiance and splendor defy description, one recalls that they were once embedded in the depths of the earth. Throughout centuries of bloody history in

far corners of the world, men fought and envied, murdered, robbed and tortured, to possess certain of them. Others have measured off a more peaceful and benevolent succession of days.

Of just what does the regalia of England consist, and which among these richest gifts of nature constitute its principal adornments?

The "regalia" are actually the ensigns of royalty. They include more particularly the apparatus of the coronation—the crown, the scepter with the Cross, the verge or rod with the dove, and the orbs of the King and Queen. The so-called staff of Edward the Confessor was made in reality for Charles the Second; and there is the coronation ring. The sword of mercy, called Curtana, is blunt; and there are two swords of justice, spiritual and temporal. The ampulla is a receptacle shaped like an eagle, and it contains the anointing oil. There is also the anointing spoon; and the coronation apparatus includes the armillae or bracelets, the spurs of chivalry, and various royal vestments. The "crown jewels" in the broad sense would embrace the Imperial State Crown or Crown of the Realm, the Queen Mother's Crown, the Crown of the Prince of Wales, Queen Mary's crown, the crown made for Mary of Modena, wife of James the Second, and a charming diadem made for this same lady.

The little diamond crown made for Queen Victoria is also part of the "crown jewels," as is the Imperial Crown of India, made for the Durbar of 1911 and now of no more than historical interest.

In addition to the coronation scepters, there is a second scepter with the Cross made for Mary of Modena and another scepter with dove made for Queen Mary the Second, who reigned jointly with her husband William of Orange. Then there is the mace. Also considered as "crown jewels," although they are not adorned with gems, are various mammoth salt cellars and plate of gold used on State occasions. But it is the jewels, with which we are concerned here.

Chief among these, and the most famous and valuable diamond in the world today, is the Great Star of Africa, cut from the Cullinan diamond. A flawless jewel of the purest water, this precious stone weighs 516½ carats and is the largest cut diamond in the world. It is set in the head of the Scepter with Cross and is held in place

by four gold clasps that can be removed so that the jewel may be worn as a pendant on state occasions. This scepter, as is the case with the greater part of the regalia, was made for Charles the Second. When the Great Star of Africa was inserted in it in the present century, this scepter was transformed into one of the most startling emblems ever fashioned by the hand of man. It is a fabulous gold rod encrusted with rubies, diamonds, emeralds, and sapphires, with this peerless jewel out of Africa's mines enclosed in a heart-shaped frame of gold. Surmounting this is an elaborate design of diamonds and rubies, topped by a Maltese cross, whose center is a wonderful emerald and whose arms are adorned with diamonds.

The remarkable Cullinan stone was found on January 26, 1905, in a South African mine belonging to the Premier Diamond Mining Company, Ltd. The finder was a mine captain by the name of Wells. On a nightly tour of inspection, his eye was caught by a fragment



◀ THE JEWEL-STUDED Sovereign's orb with St. George's spurs and the Coronation Ring
Below: Star of Africa, world's largest cut diamond

Crown Copyright photograph



glittering in the wall of the mine. He looked closer, and what he saw must have taken his breath away, for the diamond he had discovered was to prove three times the size of any known stone. It took many hours to free it from its rock matrix. When it was finally extracted and examined, it was found to weigh 3106 metric carats, or a little over one and one-third pounds avoirdupois. The gem was dull, and one side showed a smooth plane that indicated it had once formed part of a larger stone. That original crystal, as Nature made it, would indeed have staggered a miner's imagination. Many efforts have been made to locate the fabled "other half" of the Cullinan diamond. The attempt has not been given up, even today. But many skilled miners believe that it has long since been crushed and scattered.

When Wells took this mammoth stone to Sir Thomas Cullinan, the President of the Premier Mine, Sir Thomas, it is reported, presented him with a check for \$10,000 on the spot. The diamond was named "Cullinan" in honor of Sir Thomas.

Its size was at first an actual embarrassment. It is not easy to find a purchaser for a stone weighing 3106 carats. This problem was solved when, in August, 1907, Premier Botha of the Transvaal, a former Boer general who had fought against Britain, proposed its purchase by the Transvaal as a gift to King Edward VII on his birthday in appreciation of his having granted a constitution to that conquered colony. The stone was given to the king on his sixty-sixth birthday, November 9, 1907. The Transvaal colony is said to have paid \$800,000 for it, although estimates as to its value have always varied widely, some placing it as high as \$75,000,000.

King Edward expressed a desire to see the diamond before it was cut, and it was accordingly shipped to England by a devious route, making part of the journey in the hatbox of a lady who was the wife of a mine official. It was insured in transit for \$2,500,000. It was placed in the strong room of a bank in London and hence, under heavy guard, brought to the palace for the king's inspection. The big,

irregularly-shaped crystal was handed over to the king.

"This is a great curiosity," King Edward commented, "but I should have kicked it aside as a lump of glass if I had seen it on the road."

A famous diamond cutter of Amsterdam, Joseph Asscher, was assigned the tremendous responsibility of cleaving the stone. This was certainly an assignment to try the nerves and skill of the most experienced and intrepid diamond cutter in the world. There are certain gemstones that may be split apart with the same ease that a piece of wood is split along its grain, and the cleavage surfaces are bright and smooth as glass. The topaz, like wood, may be divided along cleavage planes in one direction only; the diamond may be divided along definite cleavage planes in four directions.

Early gem cutters little understood these properties of gems. They made no attempt to alter the natural shape of the diamond crystal, contenting themselves with polishing only a few faces of the stone. These were usually the four upper faces of the octahedron, the other four being embedded in a metal setting. It took centuries of experimentation in the art of facetting diamonds to discover how best to increase the brilliancy of the stone. A lapidary of Bruges, Louis de Berquem, was the first to succeed in cutting facets on diamonds not only with precision but with planned regularity. This was in 1475. Even today, East Indian gem cutters cut facets as they have cut them from early times, without regard for symmetry or brilliance. Their aim is to reduce the stone as little as possible and to place the facets wherever flaws in the crystal need to be eliminated or camouflaged.

To saw a stone apart, which is sometimes advisable, requires approximately a day for every carat

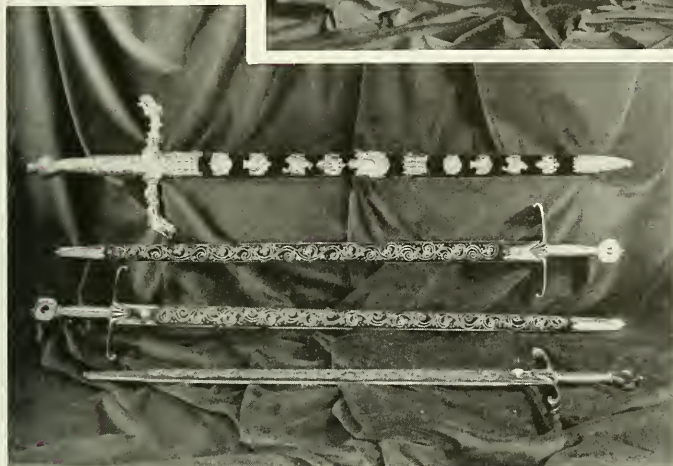
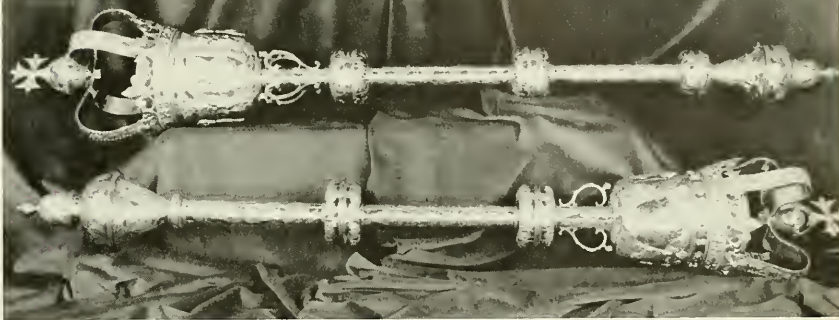
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◀ SORTED according to size and quality, these small piles of diamonds are valued at a total of \$600,000

➤ **MACES** of the Sergeants-at-Arms. They weigh almost 35 pounds each and are carried by members of a special royal bodyguard

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▲ **FOUR SYMBOLIC SWORDS.** From top to bottom, they emblemize State, Spiritual Justice, Temporal Justice, and Mercy. All of these will probably figure in the Coronation. The Sword of Mercy is appropriately blunt



▲ **THE AMPULLA,** which contains the oil with which the Queen will be anointed on head, breast, and hands

of weight. To cleave it, on the other hand, takes but a few seconds. This method splits the stone exactly along its line of cleavage by means of a sharp tap—if all the computations have been exact. If they have not, a fortune may shatter under the hands of the cutter.

A tiny notch is made in the diamond at the point of cleavage. A steel blade or ruler is then held in the groove and given a sharp tap with a mallet, whereupon the diamond—if well-behaved—parts. In the case of the Cullinan, experts were called in for consultation and there were months of study before Joseph Asscher would attempt the division. When all the decisions had been made, a spell-bound group watched Asscher make a V-shaped groove in the stone, one-fourth of an inch deep,

at the point of the plane of cleavage. In this, at 2:45 P.M. of February 10, 1908, he inserted the cleavage knife and struck with his mallet what he hoped would be the decisive blow. The general consternation can be imagined when the crystal remained intact but the knife itself broke!

Mr. Asscher had to try again, and on the second attempt he had his personal physician in attendance lest an emergency should arise from the excitement. Again the knife was inserted and the blow struck. This time the stone fell apart exactly as planned, and Mr. Asscher promptly fainted.

Although published accounts appear to mention only this single cleavage, I have been shown photographs by mine officials that indicate the Cullinan was actually di-

vided into three main sections by cleavage. From these parts, nine major gems were eventually cut. The cutting and faceting operations covered a period of many months, and the work was always done under the protection of an armed patrol. The largest of these nine stones, known as "Cullinan No. 1," was cut in the form of a drop briolette. It is a perfect stone, both as to color and structure. Despite published reports to the effect that this stone weighs 530 metric carats, its exact weight is really 516½ carats. When George the Fifth came to the throne, he rechristened this magnificent gem, calling it the "Star of Africa" in honor of the British African colony.

The "Cullinan No. 2" is sometimes called the "Second Star of Africa." This was cut as a square

gem, and it weighs 309½ carats. It is set in the Imperial State Crown, which was made for Queen Victoria in 1838. This crown, in addition to the famous "Second Star of Africa," contains 2783 other diamonds, 277 pearls, 17 sapphires, 11 emeralds, and 5 rubies. It is also known as the "Crown of the Realm" and is worn by the reigning sovereign on all state occasions.

In the coming coronation, Queen Elizabeth the Second of England will be crowned with the superb St. Edward's Crown, as all monarchs of England have been crowned since the Restoration, but immediately after the crowning, the St. Edward's Crown will be replaced by the Imperial State Crown or "Crown of the Realm." One of the sapphires in this magnificent diadem once adorned the ring of Edward the Confessor. Four of its large pear-shaped pearls belonged to Queen Elizabeth the First. But most famed of all its jewels, perhaps, is the "Black Prince's Ruby." It was given to Edward, the "Black Prince"—so called because of the color of his armor—by Pedro the Cruel in 1367.

This historic gem is actually not a ruby at all, although it was considered so for many centuries, and on the basis of this belief it had been valued at half a million dollars. With increased knowledge of mineralogy and especially of the science of crystallography, exact identification of gemstones has been made possible, and many stones that were thought to be rubies have been proved to be fine spinels or garnets. In fact, any mention of rubies in literature predating scientific methods of testing is open to question. One wonders how different history might have been if some of the "rubies" that were fought over had been known to be spinels.

The manner in which scientists distinguish between a spinel and a ruby by means of precise instruments is infallibly correct. A spinel belongs to the crystal system known as *cubic*; the ruby belongs to the system known as *hexagonal*. The

optical properties of these two systems are distinctly different, and a small and simple instrument discloses that difference. The instrument is known as a "dichroscope." There is an eyepiece at one end and a small square opening at the other. When a gem belonging to the cubic system is held before the opening and light is transmitted through the stone into the instrument, a single color will be seen. But if a stone belonging to one of the other systems, say the hexagonal, be held before the instrument, two distinctly different colored squares will appear. In the case of a spinel, the single color will be red. The ruby will show both a blue red square and a yellow red one. A sapphire, which, like the ruby is a corundum and so is governed by the same laws of light, will, when examined, also show twin colors—one square of greenish straw color and the other of blue. The unassisted eye sees these twin colors of gemstones as a single hue, a blend of the two.

Little wonder that in earlier days such a stone as the fine spinel in the Imperial State Crown of England should have won fame as a ruby. In its best form, a spinel is a perfectly transparent red stone, closely resembling the ruby. In fact, ruby-colored spinels are sometimes called spinel-rubies or balas-rubies, but the terms are misleading. The spinel is a different stone entirely. It is less hard than the ruby, and it also differs in chemical composition. One advantage it has over the more valuable and scarcer ruby is that it is much freer from faults.

Besides these red spinels that look like rubies, there are blue spinels that look like sapphires (usually paler in color) and violet spinels that look like amethysts. Then there are black spinels—once a favorite in mourning jewelry. All come, like the rubies from the gemgravels of Ceylon, Burma, and Siam.

The fabulous Koh-i-noor Diamond is set in the central cross of the Queen Mother's Crown,

which was made for the present Queen Mother Elizabeth in 1937, when she was crowned as consort of George the Sixth. This diamond originally weighed 186 1/16 carats and was irregular in form, just as the Indian cutters had shaped it centuries ago. Like nearly all Oriental stones, it thus lacked symmetry and brilliance. It was Queen Victoria, with the approbation of her counselors, who decided to have the stone reshaped and cut as a brilliant. During the process, the gem was reduced to its present size and was reported to weigh 108 carats. It is valued at 140,000 English pounds.

Opinion is certainly divided as to whether or not the stone was thereby improved. It is not, in literal truth, a gem of first quality, despite its fabulous history. Nor is it, as is so often reported, the largest or most brilliant diamond in the world, or the most transparent. Actually it is tinged with gray. However, if its size and brilliance and color have been surpassed, its adventures have not.

No one quite knows when its history began. Legend has it that the Koh-i-noor was found in a river in South India four or five thousand years ago! It may have appeared throughout the history of the East under various names. By various intrigues and stratagems, Shah Jehan, Emperor of Delhi and founder of the peacock throne, obtained possession of the stone in about 1650 A. D. The diamond remained at Delhi as the crowning jewel of the Great Moguls till 1739, when we see Nadir Shah, the Persian Conqueror, wresting it from Mahomed Shah, who at that time sat on the magnificent peacock throne. The tail of the sparkling peacock was made of precious stones of every sort and was spread fanwise to form the back of the king's seat. The story is that one eye of the peacock was the famous Koh-i-noor.

Mahomed Shah was wiser than to leave the diamond there when Nadir Shah captured the Mogul capital. He extracted it and rolled

Continued on page 240



▲ A HEAD-ON VIEW of the Spotted Salamander might be a terrifying experience if the animal were as large as the camera makes it appear in this photograph. But the creature is quite harmless and is an interesting subject to observe

A Salamander lays her eggs

A creature of two worlds, she returns to the water
when it comes time to produce a new generation

By LYNWOOD CHACE



◀ THE SPOTTED SALAMANDER (*Ambystoma maculatum*) lives most of the time under rocks and old logs in the woodland; but in the spring the female travels to fresh water to lay her eggs. Here is a cluster of them. They will produce a number of young salamanders like the one shown in the next photograph

▼ SIDE VIEW of a young Spotted Salamander, photographed under water. Note the extended gills, which are used for breathing. When the young salamander leaves the water to live on land, the gills disappear and internal lungs take over





▲ A MOST REMARKABLE LOOKING youngster is this baby Spotted Salamander, with its fernlike gills. Even after the lungs take over, permitting the creature to live the remainder of its life on land, it likes damp places

► NATURE gives the Spotted Salamander a striking color scheme—jet black with vivid yellow spots. The adult salamander grows to a length of seven inches. It must not be confused with the closely related Tiger Salamander (*Ambystoma tigrinum*), which has a spotted race in California. There are also several others that are called Spotted Salamanders. Readers wishing to identify salamanders or to know more about them will do well to consult Sherman C. Bishop's *Handbook of Salamanders*, Comstock Publishing Company, Ithaca, N. Y.





▲ THE LANDING of a small boat on the southeastern side of the island brings a violent protest from hundreds of screaming terns

Want to *Photograph Birds?*

Try this tiny island in Lake Erie, where thousands of gulls and terns come to nest each year

By CLIFFORD MATTESON



ABOUT three miles from Port Maitland, Ontario, at the eastern end of Lake Erie, lies a tiny rocky reef, barely protruding above the water level. It is about four acres in extent and is officially known as Mohawk Island. This name, however, has become almost obsolete over the years, for most people call it Gull Island. There are several trees on the island;

◀ THE HERRING GULL is the largest of the island's inhabitants. It attains a wing spread of nearly five feet



◀ THE GRACEFUL RING-BILL
in flight shows a white patch
at the tip of each wing

▼ A VIEW from the top of the lighthouse seen in the previous
picture, showing an area occupied by Ring-billed Gulls



otherwise, it is covered with dense undergrowth and much debris that has been washed ashore.

Each year during the month of June, this island is inhabited by thousands of Common Terns, Ring-billed Gulls, and Herring Gulls, which have migrated to the island to take advantage of its ideal nesting facilities.

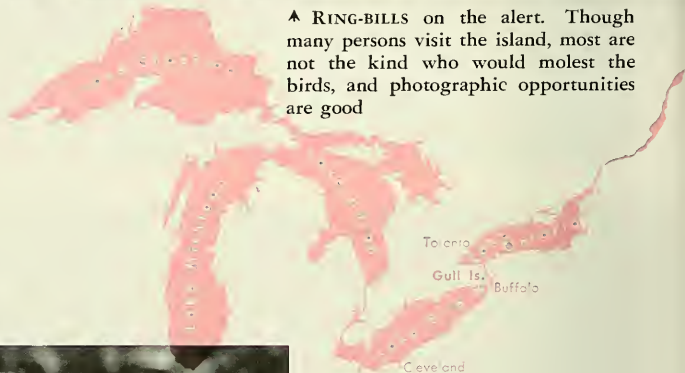
At this time of year, many ornithologists and nature students venture to the island to photograph, study, and band the birds.

The arrival of a boat at the island is a signal for the inhabitants to register their protests. It seems as if every gull on the island has taken wing. From aloft, they scream their vengeance at the intruders; and they "dive bomb" the unsuspecting victims who are busy watching their feet to avoid stepping on the eggs and the young birds.

The different gulls do not intermingle; each species seeks its own part of the island. The terns take over the southeastern section; the Ring-bills the southwestern, and the Herring Gulls the north and south ends of the island.



▲ RING-BILLS on the alert. Though many persons visit the island, most are not the kind who would molest the birds, and photographic opportunities are good



◀ AN ADULT TERN, landing on its nest. The terns do not mingle with the gulls

▼ A YOUNG TERN in the nest with unhatched eggs. All stages in the family life of these birds can be observed by the patient bird photographer on Mohawk Island





▲ A RING-BILL EGG, with the young Ring-bill seeing the light of day for the first time



▲ A CLOSE-UP OF A MATURE RING-BILL showing the black ring on its bill from which the bird gets its name

▼ LOOKING EASTWARD from the Ring-bill section of Gull Island





▲ THE CHURNING SOUND was evidently a growl, not a purr

“WOULD the Señors be interested in buying an *animalito* (‘little animal’)?”

The question was put to us by some Mexican urchins as we paused beside the Pan-American Highway in the state of Chiapas in the far south of Mexico. We managed to convey the impression that we were willing to have a look.

In a few minutes the children came back down the highway dragging by a noose a thoroughly unhappy baby jaguarundi (*Felis cacomitli*). The little cat was spitting and hissing at all and sundry. We parted with five pesos for him, as much to deliver the little fellow from his tormentors as for any other reason.

The jaguarundi is a little-known member of the cat family. It inhabits dense thickets of mesquite and other thorny vegetation, where its short legs and almost weasel-like proportions enable it to move about with ease. Only in the Brownsville area of southern Texas does its range extend to the border of the United States. Now that the great mesquite thickets of the Rio Grande Valley have been extensively cut away, we may assume

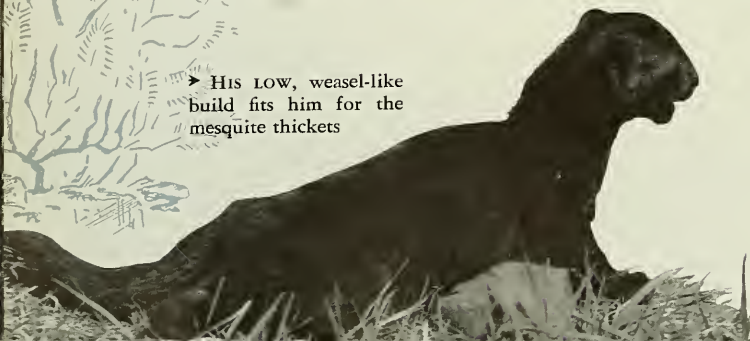
Our Least-Known American Cat—

The Jaguarundi

It had the run of the expedition truck but seemed

to prefer riding on the hood

➤ His low, weasel-like build fits him for the mesquite thickets



By

DEAN AMADON

and

BERTRAM SCHAUGHENCY

Photographs by DON ECKELBERRY

that the jaguarundi, along with many other interesting tropical species, will soon disappear from the United States.

Our "pet" was a mere baby weighing no more than a pound and a half. Long and slender, he measured about eighteen inches to the tip of his tail. He was dark grayish black, brindled with white on the head. The few white hairs on his back were scattered about here and there, recalling the cheap imitation silver fox one used to see in the days when silver fox was worth imitating. (A second color phase of the jaguarundi is rusty or reddish, and the animal is sometimes called the Eyra Cat.) Our animal's ears were large, as were its dark, greenish gray eyes. Unlike the domestic cat, the pupil of the eye in the jaguarundi does not become a narrow slit when exposed to sunlight. We feel confident that the species is active by day and perhaps by night also. The old-time Brownsville collector and naturalist Frank B. Armstrong used to encounter these cats both by day and by night on his hunting excursions. Full-grown jaguarundis are as large as bobcats.

Although our baby jaguarundi did not bite us, the ease with which he crunched the bones of birds and lizards left no doubt about the capabilities of his bullet-like head and heavy jaws. He would snip off the long wing and

tail feathers of a bird and devour everything else. Of lizards, only the long, thin tail was left uneaten. Bread, fruit, and other human fare he disdained. The Mexicans had told us, quite correctly, that the jaguarundi prefers a diet consisting of *solamente carne*—exclusive meat.

While driving, we gave the jaguarundi the run of the cab of our truck. Like other young animals, he would be very active for a half hour or so and then take a nap. He seemed to enjoy riding on the hood, out in the wind. He had to be kept on a short tether, however, because he was never really tame and would often attempt wild leaps into space from the moving vehicle.

From time to time he would utter a series of loud, vibrant chirping cries, which we at first took to be the note of some bird in the near-by bushes. Perhaps this call corresponds to the "meowing" of other cats; if so, it is far louder than the silly little "meow" we had heard the much larger puma (*Felis concolor*) utter a day or two before. Our jaguarundi also kept up a low churning sound much of the time; he was evidently growling, not purring!

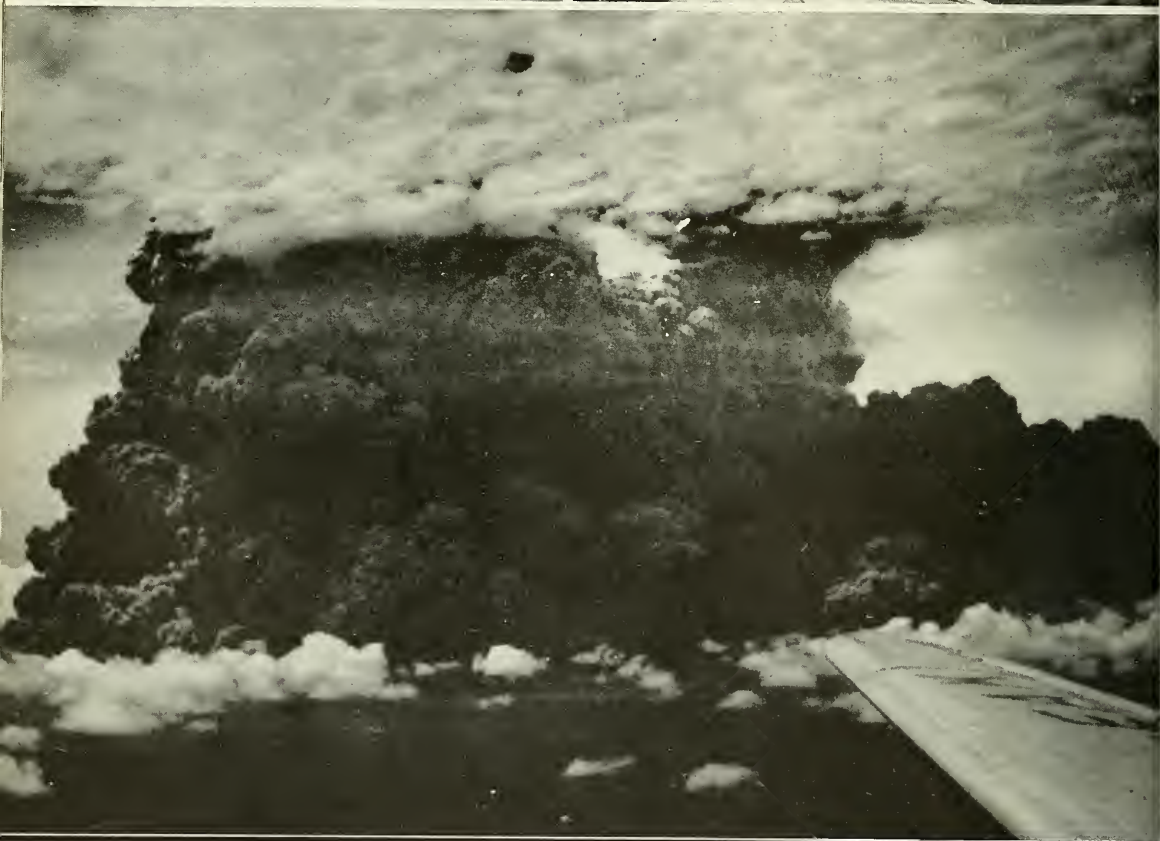
On our way north to the United States border we camped for a few days at about 12,000 feet on the slopes of Mt. Popocatepetl. The cool climate at this elevation was

hardly to the liking of our tropical feline. To make matters worse, he tangled his leash one day while we were away and became thoroughly drenched by a cold rain, which left him in a somewhat rheumatic condition. Even when he was too weak to stand up for any length of time, he would chew away resolutely at his food, pausing every few moments to rest his jaws. He seemed to be slowly recovering, but we decided that even his nine lives might not pull him through if we took him into the northern part of the United States.

On our last night in Mexico we camped beside an extensive stand of mesquite and cactus that had, as yet, escaped man's effort to convert the entire northern part of the state of Tamaulipas into one great cotton field. From time to time during the hours of darkness, a wild, squalling cry emanated from the thorny fastnesses beyond our camp. Perhaps it was a wild jaguarundi. At any rate, we decided this was a good place to release our captive. Although we had come to Mexico to study and photograph the birdlife, this little cat, with his voracious appetite for birds, had somehow won a place in our affections. It was with reluctance that we untied his leash and set him free. But he was still in home territory, and he made off through the thicket without a backward glance, apparently quite ready to resume the life for which nature had prepared him.

▼ HIS STRONG JAWS could have inflicted damage but didn't





Three extraordinary photographs taken at the moment of eruption by Captain Arthur Jacobson of Qantas Empire Airways, Ltd. Captain Jacobson estimated that the erupted mass reached a height of 50,000 feet in two minutes or less. The photographs were taken from an altitude of 9500 feet, over a period of about two minutes. The first photograph was taken from a distance of

five miles. Beholding this terrifying spectacle from the ground, the author describes it as "a terrific explosion . . . loud and sharp, almost like a series of detonations right along the range." When the explosions kept growing and coming toward them at a frightful rate, she and her friends fled, barely soon enough to be the only survivors from this area.

The Mt. Lamington Blast

One of the few survivors of an eruption unsurpassed in recent years gives her account of the frightful day when a cloud of incandescent gas claimed the lives of over 3000 persons

By LAURA M. STEPHENS

MY husband and I had lived for two years within about six miles of the mountain in eastern New Guinea whose name has become a symbol of destruction in this part of the world. Before the events of January 21, 1951, we lived a normal, happy, busy life on the Sangara Rubber Plantations, of which my husband was an Assistant Manager. There were plenty of social happenings in our small community, and 2½ miles away was the flourishing government station of Higaturu, with about 36 Europeans

and many natives in government employ and on the neighboring plantations.

We often went up to Higaturu, less than four miles from the volcano, for various social events. The Christmas before the eruption was very bright, ending with a New Year's party in fancy dress, which nearly everybody from near and far attended.

At that time, no earth tremors or rumblings had been noticed, and no one suspected that the mountains known as the Laming-

tons were preparing for one of the most violent eruptions the earth has witnessed in recent years. Very occasionally, a slight earth tremor had been experienced in the past, but living in a volcanic belt, we had expected such things.

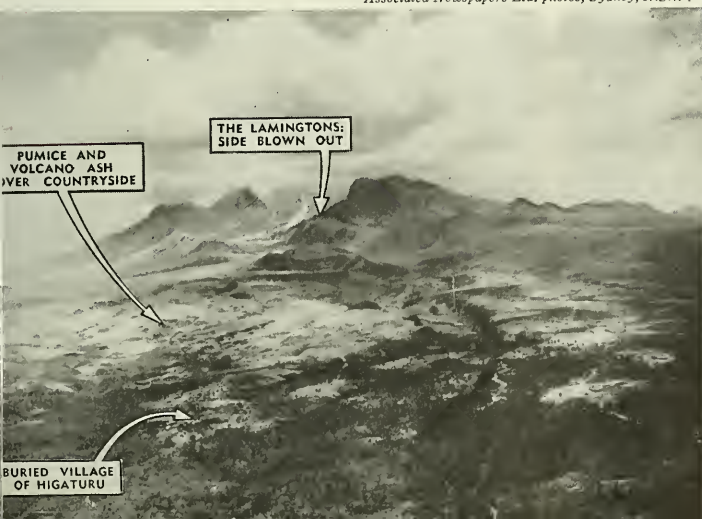
It was only about two weeks before the eruption that we felt a tremor that made us sit up and take notice. It was a far more prolonged movement than usual, but even so, we did not connect it with an impending eruption.

One week, or possibly ten days,

▼ **SCENE** of the disaster: an aerial view of the devastated side of Mt. Lamington, in New Guinea, taken a few days after the first eruption. The volcano is still sending up clouds of steam and ash

➤ **THE FIRST MAN** to enter Higaturu after the eruption: Mr. Claude Champion, his face drawn from shock and exhaustion. He is talking to Papua and New Guinea Police Commissioner Grimshaw on arrival at Port Moresby

Associated Newspapers Ltd. photos, Sydney, N.S.W.



before the actual eruption, the tremors became more frequent and therefore more frightening. From the lounge of our house we had an exceptionally good view of these mountains, and we noticed that brown streaks were appearing on the scarps and in the gulleys of the mountains. There had been a lot of rain for nearly a week, and we thought that this might have caused landslides. Some of the natives seemed pretty scared when they came down and told us that "the mountain was moving." It is now thought that these scars were caused by the heat from beneath the earth withering and killing the vegetation. The Lamingtons were densely covered with growth right to the peaks, which were conical

in shape and four or five in number.

Then, at about ten o'clock in the morning of Wednesday, January 17, we noted a large column of smoke coming from the highest peak, accompanied by rumblings and tremors and flashes of intermittent lightning. (Some reports said that the smoke had appeared the day before.) It looked just like an orthodox volcano, with the conical shape and the smoke emerging from the top. Our first reaction was relief. Now that the pressure had an outlet, we might get some respite from the almost incessant tremors. They had become especially alarming at night, possibly because we were resting then and noticed them more. It

was quite common to be thrown from one side of the bed to the other!

One particular tremor I remember really did scare us. It was a sharp, lifting, heaving movement, quite different from the rest. This one happened Saturday night, and the eruption came the next day. I believe that if we had felt another like it, we would have put as much distance between ourselves and this spot as we could in the shortest possible time.

The relief we felt when the mountain first showed activity was brief, for the tremors became even more frequent and disturbing. We wondered whether the lava would flow in our direction and at what rate, but we imagined we would



Associated Newspapers Ltd. photos, Sydney, N.S.W.

▲ VICTIMS of the volcanic blast: natives of New Guinea carrying their badly burned child after receiving first aid. Fifty victims of the Mt. Lamington eruption were brought to this station for treatment

◀ A GRIM-FACED native and his family waiting to be flown from the danger area after the Mt. Lamington eruption



Photo W. J. Langron

▲ **MT. LAMINGTON** as it appeared about eight months after the eruption. Residents noticed that considerable change was wrought in the mountain by the eruption.

A fresh lava dome was created, and what has come to be known as Avalanche Valley was formed by the removal of the north wall of the mountain

have plenty of warning. It could hardly flow so quickly as to engulf the land before we had time to evacuate. Little did we realize that this was no ordinary lava-type volcano but the explosive Pelean type.*

The eruption we were about to witness came as a tremendous blast and produced, as did Mt. Pelée, a rapidly rushing cloud of incandescent gas and pulverized mineral matter. This sort of a blast is forceful enough to knock over trees and hot enough to kill, even though it may be so sudden as not to burn inflammable objects. So you can see how wrong we were to expect slow-moving lava.

On Sunday morning, January 21, then, we rose early and settled down to our usual routine. The volcano, of course, was foremost in our minds. From time to time we would look up and see, through the clouds that had settled on the range, the huge column of black smoke, interlaced with frequent lightning flashes and accompanied

by rumblings. I had two people from Higaturu staying with me for the week end, the District Commissioner's wife and their young daughter, a girl of thirteen. They owe their lives to this visit, for of all the people then living in Higaturu, they are the only two alive today.

We sat and watched the volcano for a while before breakfast, then ate and busied ourselves in household tasks until about 10:00. At that time, we decided to have a cup of tea. I was just about to announce that it was ready when a terrific explosion occurred. The noise was loud and sharp, almost like a series of detonations right along the range. I looked up and watched for a second, as one does when at a safe distance from an explosion. But this was different. Instead of reaching its peak and then dying down, the explosion kept growing and coming toward us at a terrific rate. I called out in alarm to my husband, who was at the moment typing in the office on the veranda.

"Come quickly," I said. "The

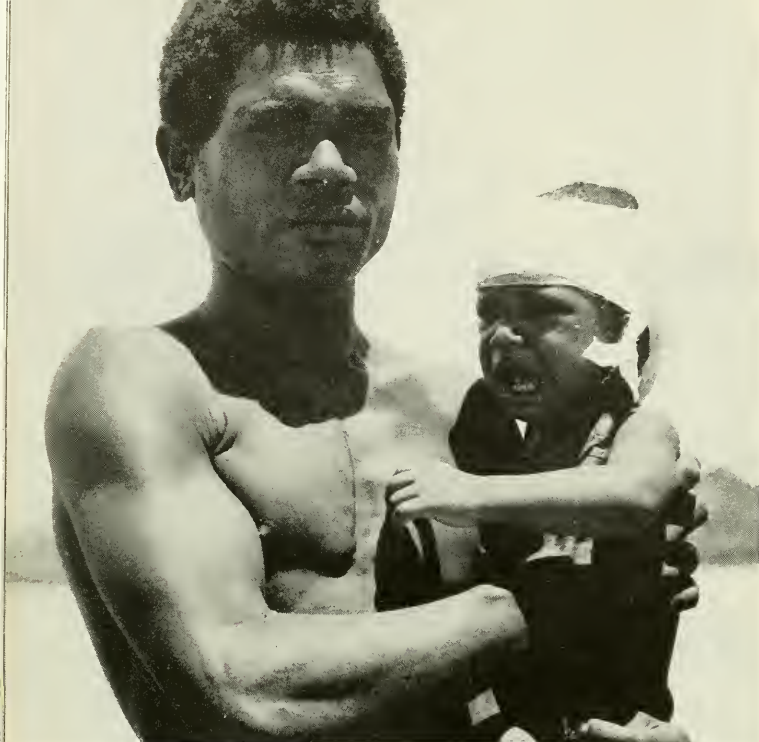
whole range seems to have disintegrated and is coming this way!"

He came in, looked for a few seconds, and then said quietly, "Come, all of you. We are getting out. Don't stop to pack anything."

We left everything as it was and went outside to a truck, which fortunately was parked in the compound. As I walked toward the truck, I suddenly remembered that my household keys were hanging in the lock of the storeroom, where there was a large sum of money. So I rushed back and locked the storeroom. Hatless, with only a light frock on, and with nothing but a bunch of keys in my hand, I went back to the truck and got in.

In the meantime, the cloud was spreading and coming on. It enveloped the sky and hung over us like a great umbrella. It was black and opaque, and the noise it made was like a huge roaring and hissing, so loud one could hardly hear oneself talk. We drove in semi-darkness to the Manager's and to the other Assistants' houses and picked them and some servants up. We decided to take a road that led

*A vivid account of the frightful eruption of Mt. Pelée in 1902 was published in *NATURAL HISTORY Magazine* for February, 1937.



Associated Newspapers Ltd. photo, Sydney, N.S.W.

toward the only bit of lighter portion that could be seen. Each moment it was getting darker, and the cloud was coming nearer in a rolling movement with that indescribable hissing noise.

We hadn't gotten far in the truck when it ran into a ditch, for the road was narrow and rather bad. We all climbed out, pushed together, and got the truck back on the road. Again it stuck, and again we got out. This time things looked worse, and we stood there simply waiting for the death that we knew was inevitable, once the cloud reached us.

While we were standing, we looked up, and the rolling movement of the enveloping lethal gas seemed to halt for a split second—then it rolled back!

It was an amazing phenomenon. At that moment, it seemed nothing less than a miracle, and we thanked God for the respite, then discussed further means of escape. We had not tried to get to Popondetta, which was nine miles away, be-

cause the cloud seemed to be traveling parallel to the road in a way that would cut us off.

At that moment, my husband and the Manager of the estate decided they would try to get to Higaturu on the slim chance that anyone could have survived. We could see that Higaturu had been enveloped by the cloud; and even at that stage (only fifteen or twenty minutes after the explosions), we felt in our hearts that no living thing could have survived the deadliness of that black, heaving mass. It was still roaring and hissing, even on its backward journey. Even where we were, breathing had become difficult. There was a heavy sulphurous smell in the air, and it was dry and hot.

It was then that the pumice rain began to fall. It fell in great clots, making a big noise on the roofs of the buildings. It was hot at first and stung the flesh. Into the minds of everyone came the thought that big boulders and rocks might be hurled upon us. So the men de-

◀ RECENT arrivals by airplane from the still smouldering area: a native and his injured son just after receiving treatment at the hospital at Port Moresby

cided that they would first try to get the womenfolk to safety before attempting to get into Higaturu, which meant that we must take a chance at trying to get through along the road.

We boarded the truck again, and the nightmare drive began. For about five miles, we were pelted with mud and pumice. Those of us on the back of the truck took shelter beneath some mats that one of the servants had with him. As we neared Popondetta, the mud became drier and came down in fine pellets like buckshot. My husband, who was driving the truck, was the most uncomfortable of all. The windshield had become caked with about two inches of pumice in the very early part of the drive, and he had to stick his head out of the side door, where he was soon half-blinded with the mud in his eyes.

At frequent intervals along the road, we stopped and picked up fleeing natives with their wives and children. By the time we got to Popondetta, there wasn't an inch of unoccupied space on the whole truck.

We were covered with pumice from head to foot—dirty and disheveled—but humbly thankful that we had put some distance between ourselves and the volcano. That we had walked out of our homes and left all our possessions (even to cups of tea poured ready for drinking) didn't seem to matter. Nothing mattered except that we had been spared a horrible death and could live on to work again and rebuild what we had lost. We were taken to the home of an Agricultural Officer at Popondetta, and the men went back to Sangara to see if they could find out what had happened to Higaturu.

The heroism displayed by our men on that day was something of



Laura M. Stephens photo

which I shall be proud all my life. From the Sangara side of the Lamington District, there were only nine survivors—our three men, we six women, and one small girl of thirteen.

At Popondetta, three more men joined ours, and they went back immediately into what they knew not, to see what they could do. My husband was driving the truck, and when they had gone halfway, they met the first of the hundreds of casualties they were to see that

day. The Reverend Dennis Taylor, Anglican Minister of the Sangara Mission in Higaturu, had, by some miraculous means, escaped instant death from the blast and had walked out for a distance. He had been picked up by some of his mission boys and brought on a litter to a place called Mongi. He was very badly burned all over his body, but his fortitude was amazing. All he could say was that he had left his family to go for help and that someone should try

◀ **BEFORE THE ERUPTION:** the author's house on the Sangara Rubber Plantation, two and one-half miles from Higaturu and about six from the volcano

to get to them. My husband and the other men continued to try to get through to Higaturu.

Father Taylor was brought into Popondetta and cared for by the Agricultural Officer's wife and sister and the wife of one of the Mission's laymen. He lived in terrible agony until 4 o'clock the following morning and then died.

Meanwhile, the truck had gone back to Sangara and was aided by two other trucks. Then a steady stream of burned and shocked people began staggering and crawling in. I shall spare the reader the horror of the scene. The groans of the living and the wailing of those who recognized their dead are

▼ **AN AERIAL** close-up of the destruction from 500 feet. Photographer Norman Herefort of the Sydney

Sun, could feel the heat from the smouldering mountain, and the sulphur fumes made breathing difficult

Associated Newspapers Ltd. photo, Sydney, N.S.W.





something I shall hear until the end of my days. I believe that the volcano killed over 3000 persons.

There was no way for us to send for help. The Higaturu radio had been silenced, and word of the eruption was broadcast by a planter on his own radio. He lived on the far side of Lamington and had been pelted with pumice as badly as we had. Also, a plane flying over the area in the morning had seen the first eruption and had reported it to Lae.

About dusk, a plane came over and circled. It dropped leaflets telling us that a Government cutter was on its way from Lae and would be in Killerton, a port fifteen miles away, the following morning. We beckoned frantically for them to land, but apparently they took our gestures to mean that we were all right for the time. I shall never forget how my heart sank when that plane departed.

The Popondetta airstrip was at that time only a small one for aircraft of the Dragon type, and it was not known if larger craft could land with safety. However, on Monday, intrepid airmen landed large craft on that strip, which speaks well for their courage in the emergency.

Meanwhile, however, the people had decided that the injured should be taken to Killerton to await the cutter. The truck carried several loads of the injured there and left them in the care of some mission people until the cutter could arrive next day.

The last trip to Killerton coincided with the major eruption of Mt. Lamington at 9:30 that night. My husband saw it from Killerton, and from that point it appeared that the cloud, visible through intermittent flashes of lightning, had enveloped Popondetta. He stepped on the gas as hard as he could and returned to meet a party of us—women and children from Popondetta—on the road. We, too, had feared that the cloud might reach Popondetta and had started out on foot toward Killerton. However, it didn't travel that far, and the men bundled us back into the truck and took us to Popondetta once again.

That night none of us slept. The men took turns watching for an hour at a time, and somehow the night passed. By 4:00 in the morning, the truck was once more in action. Reliable information now indicated that help for the injured could be secured more rapidly by airplane than by cutter, so the survivors had to be brought back to Popondetta. It was also decided to evacuate all the women and children from Popondetta to Moresby, though I personally would have preferred to stay there with my husband. We were all put aboard the first aircraft and taken into Moresby, where the Red Cross and other helpers gave us much needed and appreciated help.

The men brought us harrowing tales of the sights along the road toward Sangara and Higaturu district. Everywhere from Popondetta

onward the ground was covered with a thick coating of pumice. Near Sangara, the whole underbrush of the jungle was flattened, and one could see for miles where once thick undergrowth had barred the view. Perhaps less than a mile past Sangara, the devastation began. All along the road, trees had fallen, and those that had not fallen were entirely bare of foliage. Often the trucks had to stop to clear the road of the victims who lay where they had fallen in their attempt to escape the cloud. At Andemba, about four miles from the volcano, heavy timber across the road made it impossible to get farther. The road had subsided in places; in others it was blocked by landslides. Over everything lay an unearthly silence, broken occasionally by the rumbling of the mountain. Bodies lay piled in the villages, on the ground, and in the houses.

When a scientific party decided that it was safe for us to return, my husband and I went back to Sangara on April 29. In those few short months, high *kunai* grass had grown up all about the house, and the house was full of pumice, which was difficult to get rid of. However, in time the place was cleaned up, and today everything is almost as it was before, except that there is no Higaturu and no neighbors there as once there were.

So prolific is the growth of the jungle that much of the devastated area is now overgrown and green again. Only the nearer approaches



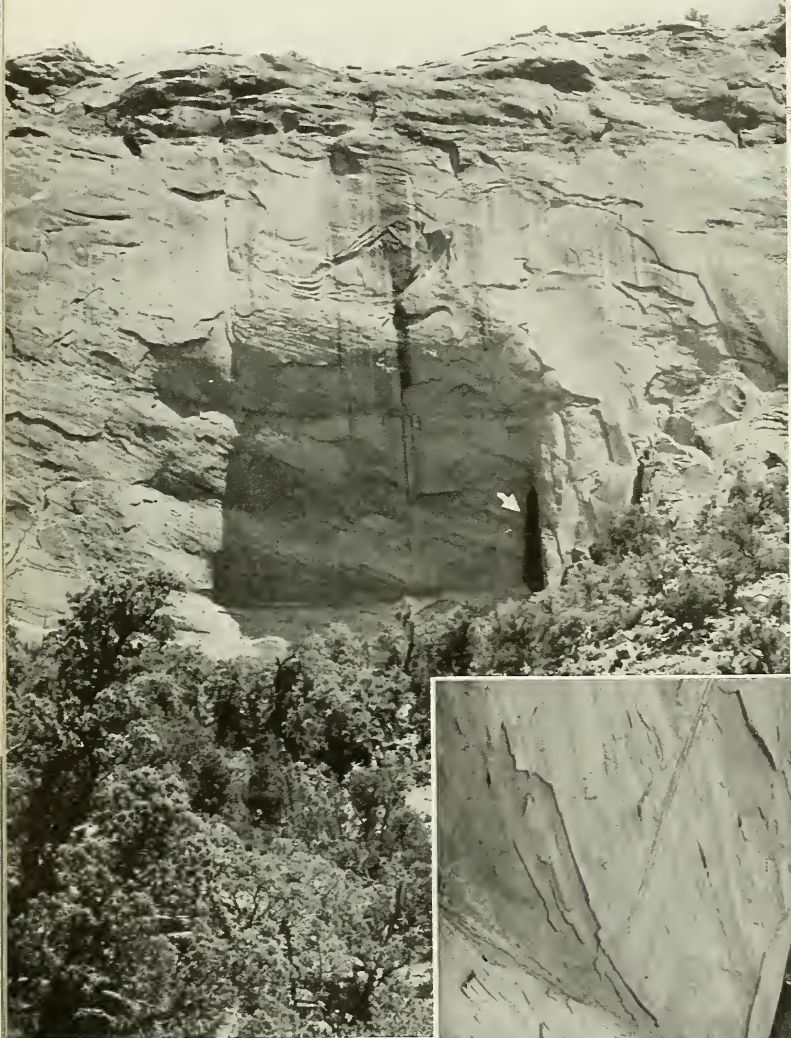
SIX STAGES in the eruption of Mt. Pelée, illustrating the explosive type of eruption that Mt. Lamington displayed. The destructive force of this type of eruption is caused by a rapidly rushing cloud of incandescent gas and pulverized mineral matter. Sometimes the expression of "fire avalanche" is appropriate. The blast may be forceful enough to knock trees over and hot enough to kill, though it may be so sudden as not to burn inflammable objects

Photographs by A. Lacroix

to the mountains and the mountains themselves remain bare and stripped in mute witness to the dreadful power that stripped them of all their life in a twinkling of an eye.


The mountain is still sending up columns of steam, but it seems to be gradually settling down. Perhaps it will remain quiet for a long time. In any case, should it erupt again, I think we shall be forewarned by the signs that are a prelude to its activity; and, please God, we shall be well away before it really sends forth its death and destruction as it did before.





▲ THE STRANGE PLATFORM is located in the east wall of Segi Canyon, in a deep vertical cleft as indicated by the arrow

➤ A VIEW of the Scaffold from another angle. Note the fragmentary ruins jutting from the base of the cliff and also to the right of the crevice. These show how high the platform is

Mystery of SCAFFOLD



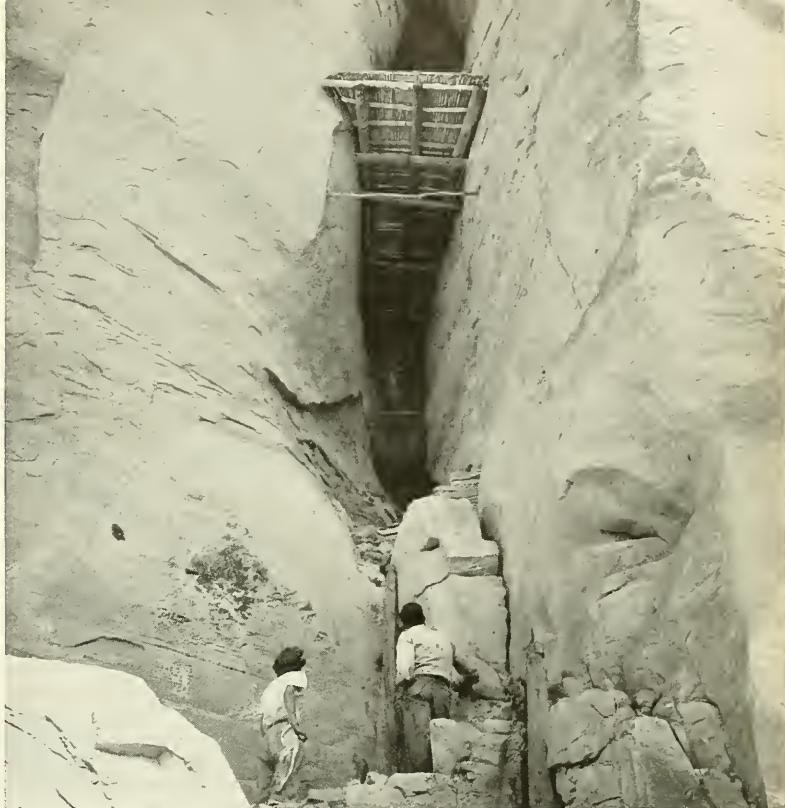
High in a crevice
in Arizona's Canyon country
lies one of the
most fascinating
archaeological riddles
of the Southwest

HOUSE

By WILLIAM B. SANBORN

*Supervisor, Department of Audio Visual Aids,
San Francisco Unified School District*

All photos by the author



▲ THE AUTHOR'S WIFE, Joan, and Superintendent John Aubuchon, examining the platform of Scaffold House. It is unique, mystifying

THE thunderstorm was over quickly, and we watched a magnificent rainbow form its arch over Segi Canyon and then fade into the gathering dusk. The wonderful wet-desert-and-piñon smell hung heavy on the air, mingled with the pungent odor of a near-by Navajo campfire. We sauntered back to the house with the Aubuchons, enjoyed supper, and then relaxed in the living room to swap stories of cliff dwellings and ruins we'd visited and explored.

"You know, Bill," said John Aubuchon, who is Superintendent of Navajo National Monument, "we've seen some fine ruins here—Betatakin, Keet Seel, and Inscription House, but there are dozens out in the surrounding country that are of real interest also."

Having made various trips through this region before, I replied, "Yes, I've been to at least a few of them."

"Ever seen Scaffold House?" queried Auby.

My wife and I sat up with obvious interest. "It's really unusual," said Ruth. "You and Joan certainly should see it this trip. You can take it in tomorrow on your way to Keet Seel by going the long way over the mesa."

Early the next morning we reined in our ponies at the edge of Segi Canyon. Hundreds of feet below us the broad canyon bottom wound its way through a spectacular labyrinth of colored sandstone cliffs, swaths of quaking aspen, and piñon-capped mesas. Auby pointed north up the Segi and indicated

a cliff face some distance away on which we could barely distinguish a tiny black streak.

"That's it," he said, and we turned our ponies down the steep trail into the Segi.

An hour and a half later we tethered our animals in a group of fragrant piñons in the canyon bottom and then gazed far up on the canyon wall to a shallow cave. We could see a large black crevice that rose vertically from the right-hand end of the cave. We picked our way upward over a rough talus slope that streamed down from the cave site.

From the canyon floor no evidences of ruin can be seen, except for a faint line across the midpoint of the crevice; but once the cave is reached, the picture changes.

Actually the cave is so shallow it might better be referred to as a huge protected ledge. This is the site of Scaffold House. Although a few fragmental walls and rooms protrude above the rubble or cling to the face of the cliff, the ruin proper is in a state of almost complete disintegration owing to its exposure to the elements. The depressions of collapsed ceremonial chambers, or kivas, are quite evident. It was a fair-sized village, perhaps containing 40 or more rooms and kivas stretching along the ledge for about 150 feet.

But was this what we had come so far to see? We'd been in dozens of cliff dwellings that surpassed this. However, we had not reckoned with the cavernous black crevice at the far end of the ruin! It is the contents of this crevice that gives the site the name of Scaffold House.

Inspecting the crevice, we found ourselves faced with one of the most fascinating archeological mysteries of the Southwest. Tucked high in the crevice (which has been blackened by rain-water drainage down the cliff), is a remarkable platform. In the protective shelter of the crevice this platform, or "scaffold" as it has been nicknamed, is in an extraordinary state of preservation. It is fashioned entirely from small log sections, slender poles, and boughs.

The ancient engineer who built this structure was a true craftsman. He probably didn't hold a card in the Cliff Dweller Engineers of America, but he was evidently a specialist. The heavy stone ax-hewn crossbeams supporting the platform are securely anchored in the sandstone sides of the crevice. Pairs of holes were actually pecked into the rock, with a key channel running down into one of them. Evidently they placed the end of a beam in the straight hole and then slid the beam obliquely into the keyed hole opposite—a clever trick and perhaps the only way of solving this problem. Three long poles form the bed of the platform, upon which a careful crosshatching of small

limb sections topped with earth has produced the floor. The platform is approximately twenty feet above the ground, about five feet wide at the lip, and about sixteen feet in length.

Crosswise at the front of the crevice and about three feet below the platform is a solitary narrow pole, firmly held in place by anchor holes in the sandstone.

The entire structure is in such flawless condition, owing to its sheltered location, that it appears to have been erected only last month, or perhaps last week. Instead, this platform has probably occupied its lofty perch since around the year 1275 A.D., at which time the numerous cliff pueblos of this region flourished. This unique feature was unquestionably constructed by the ancient Indians who built and occupied the remainder of the ruin.

There is nothing to show that any major masonry portions of the village were near this feature. There are the remains of a small dwelling unit directly below the crevice and another tiny circular structure on a narrow ledge to the right. The slight amount of fallen debris and masonry rubble near the crevice indicates that there were no two- or three-story units here that would have reached to the platform. A few blocks of stone and masonry suggest that there may have been a very low wall in the entrance to the crevice proper.

Access to the platform must have been gained either through a rectangular opening located some six feet back from the lip, in which case a long pole or ladder would have had to be used, or by worming one's way up the back of the crevice where another opening in the platform is located. In either case, access is not easy. There is nothing on the top of the platform, except a superb view of Segi Canyon.

Visitors are wholeheartedly discouraged from attempting to reach the platform. Originally, it probably would have held considerable weight; but after many centuries,

it is dry and fragile. I doubt if it would hold a man today. In any event, the risk of damaging this valuable relic is too great to justify a test.

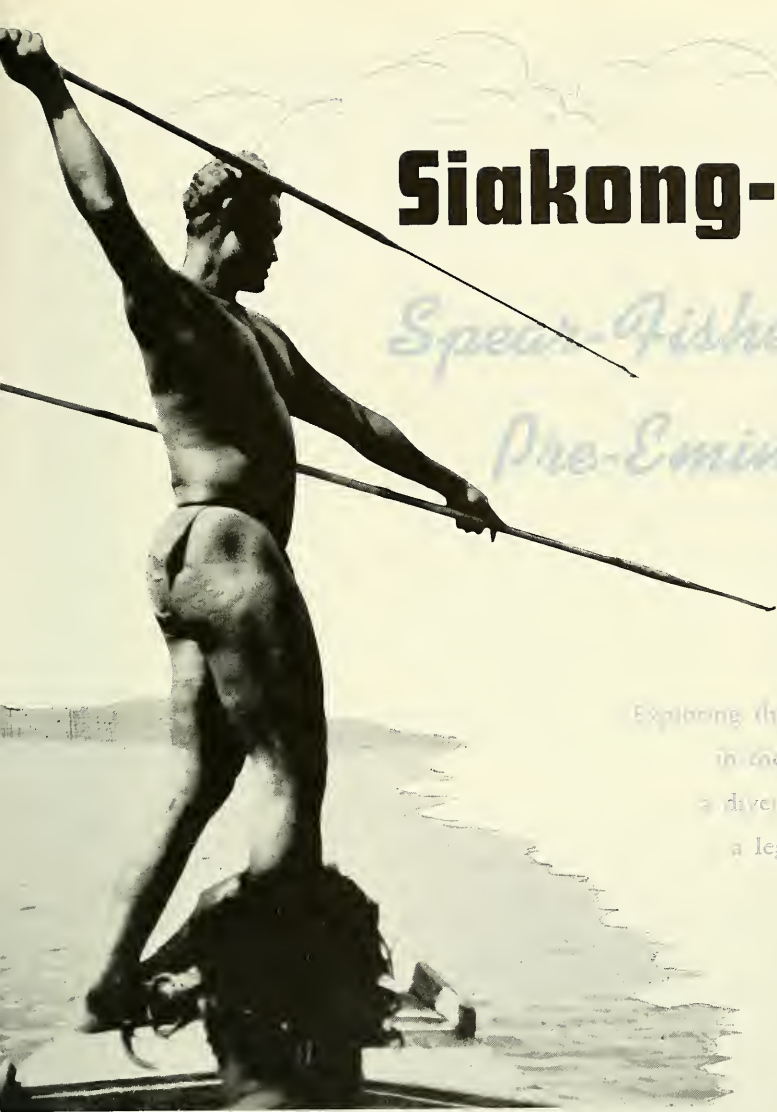
To date the actual purpose of the platform is unknown, and I know of no other comparable feature anywhere in the Southwest.

When one studies cliff villages and pueblos, there is admittedly a similarity to them all. However, we have yet to visit one where we could not find something that added a local flavor or "touch" to the site. Examples are the odd flying-buttress doors in Inscription House, the towers of Hovenweep, the pottery chinking in Long House, the decorative stone banding of Peñasco Blanco, and the deeply cut mesa trail to Tsankawi. But if you like to probe mysteries, here is a dandy—the platform at Scaffold House.

Why was it built and for what purpose? Here are a few ideas. Perhaps it was used for ceremonial purposes; many Indian groups select rather spectacular locations for conducting such activities. Or maybe this was a storage platform, a place where surplus corn, squash, and piñon nuts were stored against foraging rodents. It might have served as a lookout post or sentry box, since it affords a good view of the approach to the village. Also it may have served as a refuge in case the village was attacked. However, I doubt that there would have been room even for the women and children to gather on the platform.

The mysterious "scaffold" may have served one of these purposes, a combination of them—or none of them at all!

Long experience in the ruined cliff villages and pueblos of the Southwest has taught us to hold our prehistoric Americans in high regard. As our ponies clattered back up the rocky trail, we were convinced that Scaffold House presents one of the most fascinating riddles and represents as fine a feat of prehistoric engineering as we had ever seen in the Southwest.



Siakong-

Spear-Fisherman

Pre-Eminent

Exploring the sea bottom

in the Palau Islands with

a diver whose feats are

a legend of the South Seas

By

EUGENIE CLARK

All photographs by the author

I MET a number of interesting people in the Palaus. There was a native called Stanislaus, who helped me poison pools with my rotenone preparation. He also tried to poison himself by eating the ripe eggs of a blowfish when his wife left him. And there was Bismark, who showed me how to use the fresh roots of the local Derris plant to poison fishes in open reef waters. But the name Siakong recalls the most wonderful

underwater adventures I experienced in the South Seas.

Siakong was a betel-chewing, wife-beating drunkard. But he was the best spear-fisherman in the Palaus—maybe in the whole world. I'm not just biased, though he did teach me spear-fishing and a hundred other things about the underwater world. His stupendous skill was an undisputed fact among all the Palauans.

Siakong was a man just over 50

when I knew him. What he was like in his youth will be a legend of the Palaus. The stories about him are unbelievable—probably exaggerated by the tellers, including Siakong himself. But I will tell you what facts I know about him—my firsthand experiences with him in the waters around the Palau.

The expedition on which Dr. Clark had these experiences was sponsored by the Office of Naval Research and was under the joint auspices of the Pacific Science Board and the American Museum of Natural History.

Siakong worked for the Hills at the Pacific War Memorial Station, then located in Koror. He was their most valuable handyman, for he could do the work that required the physical strength of three average Palauans. His working day ended at 3 P.M., and I used to hire him to come with me on late afternoon trips and all day Sunday.

Siakong knew a native named Niraibui, who owned a one-cylinder inboard motorboat that could hold up to six persons. So besides the three of us, we sometimes took other fishermen; and on Sundays we'd invite one or two of the scientists who happened to be there that week. A professor from Swarthmore was as impressed by Siakong's magnificent build and strength as the rest of us and promptly nicknamed him King Kong.

A small red loincloth and homemade goggles formed Siakong's

diving outfit. The rest of the time he wore an old pair of khaki shorts over his loincloth, a dirty handkerchief tied around his head, and a decrepit straw hat over the handkerchief. When he took these off to go into the water he was suddenly metamorphosed from a bum into a statue of a Greek god.

Siakong knew the best places to get the fishes I was after, which always seemed to be where there were the most beautiful coral reefs. The reefs were a long way out from the town of Koror. We usually went out via Malakal Harbor, where we could look deep into the clear water and see sunken battleships from the war days. Niraibui's motor conked out every so often, and we sometimes found ourselves paddling back so late that the water was inky black, except where our paddles gave a trail of phosphorescence given off by the microorganisms we disturbed.

Siakong had an exceptionally nice lightweight throw-net, which he had made himself out of nylon.

Even I learned to use this net a little. Siakong's spears, however, were his main equipment. They had metal heads and bamboo handles and were balanced so nicely that you could maneuver them underwater with ease, regardless of their enormous length. And they were just light enough for the bamboo end to float so you could recover them easily. He also had several shorter handled, four-pronged spears for catching small fish. The prongs on these were small and fine, and Siakong could get a tiny filefish without perceptibly damaging it.

It was great fun to watch Siakong spear fish from above the water. He would stand on the bow of Niraibui's boat, a long spear in each hand, as we putt-putted to the outer reefs. I would sometimes stand up searching the water, too, but I could never spot a fish before Siakong. A spear would be flying through the air as I opened my mouth to call out, "There's a fish!" If the first spear missed, the second one was on its way in a flash, and

◀ SIKONG using the light nylon throwing net with which he taught the author the art

▼ THE TURTLE that took part in the underwater rodeo staged by Niraibui and Siakong



Siakong seemed to predict the direction in which the fish would dodge the first spear. Whether he got the fish or not, this was a noisy affair, once the spears were thrown, for Siakong would be either cheering or cursing himself at the top of his lungs.

Underwater it was different. It is possible to make noises beneath the surface by shouting, making bubbles and other sounds or vibrations to disturb the fish when necessary. Siakong was always silent. But you often saw him grinning broadly, and his eyes sparkled through his water goggles. Here there was no suspense about whether or not Siakong would get the fish he was after. It was only a question of how long it would take him and what tricks he would use.

The first fish I speared was a triggerfish. But it never made a specimen for a museum. I chased it with no more finesse than an infant reaching for an ice cream cone. When I managed to get above it and made ready to lunge my spear, it turned on its side to give me a last look and then slipped into a small hole in the reef. But its tail end was still half out. It was like spearing a stationary object. The first thrust of the spear didn't penetrate the tough skin, but the second did.

When I tried to pull the fish up by the spear, it was stuck tight in the hole, and I only succeeded in pulling out my spear and leaving a big gash in my specimen. I speared it again and pulled with the same result. I had done a fine job of tearing the specimen to shreds. I gave up and joined Siakong, who was spearing fishes some distance away and hadn't seen my clumsy efforts.

A large brown triggerfish swam within sight of us. I pointed to it, but Siakong was already slowly swimming after it, circling around it to head it off from the deep water. Finally it went into a hole—but again the rear end was sticking out.

Then Siakong did something I thought was odd. He let his spear

float to the surface and dove after the fish empty-handed. He went right to the hole and, gripping onto a piece of heavy coral with his left hand, slipped his right hand into the hole where the fish was. He looked up at me with a triumphant grin as he withdrew the fish with his hand.

Then it dawned on me what he had done. Triggerfishes are so named because of an ingenious mechanism in their first dorsal fin. This fin has three spines, the first of which is large and tough. When swimming around, triggerfishes usually keep this fin folded flat on the back. When frightened, however, a triggerfish will often slip into a small opening and then erect its large spine, thus locking itself in its hiding place. No amount of pushing or pulling can lower this spine, and it is very hard to break it.

But the third spine on that same fin, although sometimes so small that it shows as nothing more than a tiny button, is actually the *releaser* for the first spine. A slight

pressure on it and the whole fin collapses. Siakong, of course, knew this trick and had simply pushed the right "button" to back the fish out of its hole!

It wasn't always quite so simple, however. Sometimes a triggerfish would go so deep into a coral crevice that a hand could not reach the releaser of its dorsal fin. For this situation, Siakong had a chisel, and with the help of a stone, he'd break away the coral around the hiding fish. It wasn't easy for a fish to escape Siakong.

One of Siakong's remarkably simple methods of spearing fish underwater was literally "breath-taking." He would find a reef well populated with fishes and then dive calmly to a depth of about 10 or 20 feet, sometimes weighting himself with a rock so that he could sink without swimming. He'd get a firm grip on the reef with his legs or free arm, poise his spear in readiness, and then—wait for the fish to come to him!

The first time I watched him do this, it alarmed me. He dived and

▼ THE AUTHOR (*right*) with Bismark, a native fisherman, and his wife in the Palaus. Her diving day began in mid-afternoon, when Siakong had finished his work as handyman and could go with her to the reefs he loved





▲ It was hard to get Siakong to pause long enough for the camera

➤ THEY never took food with them, for the sea always offered much more than they could eat

lay motionless on the reef, like an animal about to spring on its prey. His brown body and red loincloth blended with the kaleidoscope of colors on the surrounding reef. The fishes began to regard him as part of the corals and came very close.

I was watching from above. I was not used to Siakong's extraordinary lung capacity, and after he had been down a long time without moving, I began to worry. So I swam down to him and tapped him on the head to make sure he was all right. He turned and looked up at me with his usual underwater grin as I reached for a piece of coral to hold myself down. I



▲ NIRAI BUI ran the engine while Siakong remained in the bow, ready to spring into action with his spears. A chance to collect underwater creatures with a museum scientist put his talents to full use and suited his temperament perfectly



tried to make an expression with my face to ask him what he was doing; but he was looking at my hand, and the grin had faded. He reached for my arm as I felt the "coral" under my hand suddenly move.

I saw to my astonishment that my hand was holding onto the side of a giant clam—the sort that is sometimes called a "man-eating"

clam because it can close with a viselike grip on a diver's arm or leg until he drowns. The clam had just snapped shut and my fingers were only a fraction of an inch from the opening between the two halves of the shell!

As we swam up to the surface, Siakong pointed to the wall of coral along which I had carelessly descended. Partly imbedded in the

➤ TWO SHIPS in Malakal harbor of the Palaus, where the author, Siakong, and Niraibui had to pass in their little boat to reach the outer coral reefs



▼ A TYPICAL PALAUAN OUTRIGGER, with two trap fishermen, Meleamar and Ngiraibuuch



corals were dozens of these clams, all with their shells gaping open. Their shells resembled gray dead corals. Inside, their soft flesh had the beautiful colors of the surrounding living corals and of the plants and animals that encrusted them. They were well camouflaged; but from then on I learned to distinguish them from anything else.

Siakong taught me, however, that even the largest of these clams can be handled safely and that they are among the most delicious of raw sea foods. He would dive down to an open clam and wave his hand over it. Often this was enough to stimulate the light-sensitive flesh inside, and the clam would close. If not, Siakong would tap the side of the shell. Then he could pry the clam loose and bring it up with him. With a rock or his chisel he chipped open a part of the curved meeting edges of the shell—just enough to slip in the blade of his knife. With a little cut in just the right place, the shell

would fall right open, and we could reach in and pull out all the “meat.”

The adductor muscle—the large white muscle that connects the two halves of the shell and closes the clam with such force—is truly a gourmet’s delight. In a scallop shell, it is the part that provides us with fried scallops. This needed only to be washed off in sea water and it was ready for eating. In texture, it was like biting into a crisp cucumber. It had a sweet, clean, indescribably pleasant flavor. “Man-eating” clams became a regular part of our reef picnics, along with raw fish, a tasty pinkish seaweed that grew in long spaghetti-like strands, and tiny limpets. We never had to bring any lunches with us, for we were always swimming among more good sea food than we ever could eat. Sometimes if the day was exceptionally cool or rainy, we might head for the nearest island, make a fire, and cook some of our sea food.

Ordinarily rain didn’t stop us

from spear-fishing. The reef water was so clear that it took more than average rain clouds to make visibility poor. The first time we started spear-fishing in the rain, however, I thought it would prove a waste of time. When I got into the water and looked around, it was full of wavy lines and everything was blurred as if I weren’t wearing my face mask. But Siakong and Niraibui were diving without concern. Presently I took a dive, too, and when my face reached about four feet below the surface, the water became its usual clear self. Then I realized that the blurring near the surface was the result of the fresh rain water mixing with salt water, something that always happens when two liquids of unequal densities are first put together. I’ve never come across an English word for it, but German chemistry books refer to this as “Schlieren.” So for spear-fishing in the rain, one merely has to dive below the schlieren layer and reach the homogeneous sea water.

It was on such a day that we came across the largest giant clam I ever saw alive. Siakong and I were swimming across some open water toward a reef where Niraibui had anchored the boat and was sitting in it chewing betel nut and keeping his head dry under Siakong’s straw hat. We swam along, diving now and then below the schlieren layer for a look around. I was getting ahead of Siakong, for he was stopping for deeper dives, when I heard him call me back.

“Nechan (Big sister), come see here.”

I swam over to him, dived below the schlieren, and looked down

where he was pointing. I couldn't make out much until I was a few feet deeper. Then I could see a broad stretch of sandy bottom, and sitting in the sand was a clam. It looked like an average-sized giant clam. However, there was nothing around with which to compare it, and I couldn't estimate the depth. Siakong started to dive toward the clam, and I followed, swallowing to adjust my ears to the increasing pressure.

I've never measured how deep I can dive, but I know that at more than 20 feet under, my face mask cuts into my head and my ears and nose feel uncomfortable. Usually I don't go much deeper, for I have always found enough activity in the top 20 feet to keep me occupied and satisfied. But this time I followed Siakong until I felt I was well below my usual limit, and I knew my breath wouldn't last if I went any deeper. I could see Siakong far below me getting smaller and smaller until he reached the clam.

Then I saw that it was truly a giant.

Siakong looked like a midget beside it. I saw him give it a kick to close the huge jaws, which could have held all of Siakong with ease. And then I had to shoot for the surface. I was still panting heavily when Siakong finally came up with no sign of strain.

We got Niraibui to come over with the boat, but we couldn't improvise anything long enough to reach bottom and help us haul up the clam. Then the three of us dived toward the clam again, but I stopped at a comfortable depth and clung to the dangling anchor while Niraibui continued downward with Siakong. I doubted that even the two of them together could lift the clam an inch.

The clam's jaws were open again. Siakong reached it and kicked them shut. Niraibui hovered about Siakong's head for a second and then headed back for the surface, where we met, both well out of breath.

"O kina ne?" (It's a big one, isn't

it?), Niraibui exclaimed to me. His eyes were bloodshot, and I figured he must have been drinking as well as chewing betel nut, for his wind was usually much longer than mine.

Siakong still had not come up. Niraibui and I dived under again. As we descended, I made out a sight that sickened me with horror. *Siakong was caught in the clam!*

The jaws of the gigantic mollusk were clamped tight, and Siakong's arm was in them up to the elbow. Siakong wasn't moving. I expected Niraibui to continue all the way and at least attempt a rescue, but the bleary-eyed fellow swam back to the surface. In the excitement, my breath was shorter than ever. I came up gasping and started hollering at Niraibui in panic. My flimsy Japanese came out all mixed up, and he looked at me surprised and then blankly. I felt helpless and desperate. Siakong was trapped and would be dead in a few seconds if we couldn't find some way to help him. How could Niraibui tread water there so calmly, even if he were drunk!

Short of breath and good for nothing, I nevertheless adjusted my mask to dive again. But—just then Siakong popped up beside us—panting but grinning! He lifted his arm out of the water, the one I had seen in the jaws of the clam, and held up the biggest clam muscle I had ever laid eyes on.

Niraibui, of course, had understood all along. The clam was impossible to lift off the bottom, and Siakong had broken the lip of the huge shell enough to reach in and cut loose the adductor muscle with his knife.

Niraibui was laughing. "She was ready to kill me because I didn't try to save you!" he told Siakong, who howled with delight. I started

◀ "KING KONG", as they nicknamed him, knew where the fishes were, and when he hurled his spears—win or lose—he would fill the air with lusty shouts



to feel a little ridiculous, and when they went on to kid me unmercifully, I got angry. Finally they stopped, and the rain, which was still falling, cooled me back to normal. Soon we all sat contentedly in the boat, munching on a delicious clam muscle the size of a man's thigh. Niraibui and Siakong stuffed their mouths to keep from laughing any more.

There was one time, however, when Siakong missed getting a rare specimen for me. The day started off wrong to begin with. It was a Sunday, and we had invited Harry Uyehara, an anthropologist, to come along with us. We were to meet at Niraibui's boat at 7 A.M., but at 7:30 Siakong had not shown up. He was unreliable when it came to many things but not to a spear-fishing trip. He was always sober on such mornings, no matter how wild had been his night before.

We finally went to his house.



▲ A NET drying in front of a Palauan hut

"Siakong not here!" his wife said and slammed the door in our faces. A little boy standing outside whispered to us, "He's in the cala-boose."

"What's he in for?" we asked the jailkeeper when we reached Siakong's other quarters. We learned that the night before, he had beaten up several men, including a policeman, and had then gone home and thrown his wife off the back porch into their taro patch. We also learned that this wasn't unusual for Siakong.

We were allowed to visit the jail. Through the bars we saw a big room with a number of drunks strewn about, but Siakong was pacing the floor like an alert wild beast. When he saw us, he came over and hung his head. "*Gomenasai, Nechan.* (Forgive me, Big sister)."

Harry, one of the most diplomatic and well-liked persons in the Palaus, somehow talked the jailkeeper into releasing Siakong in our custody, and off we went to the reefs.

We went to a reef I hadn't seen before. The corals grew on a wide

ledge about fifteen feet underwater. The ledge dropped off suddenly at its outer edge into what seemed to be deep ocean. When they had their fill of spear-fishing, Harry and Niraibui climbed back into the anchored boat, while Siakong and I continued our favorite sport. There were a number of balloon fishes and other easy-to-spear plectognaths around, and we worked our way after them toward the edge of the reef.

I was struggling to get a triggerfish to fold up so I could pull him out of a crevice, when Siakong tapped me on the shoulder. He was pointing off the reef. As I watched, I saw an incredible sight coming from the deep water.

At first I couldn't make out much except a light haze in the otherwise richly blue water. The haze was moving toward us. As it came closer it resolved into huge forms. It was like a flotilla of submarine dirigibles slowly coming at us. There were so many I couldn't count them. Each was like a huge fat pig and had no color except a uniform gray-white.

They were fish, undoubtedly,



➤ BACK in the American Museum, the author keeps her hand in on the net-throwing technique taught her by the great Siakong

but a kind I had never seen before. They looked uncanny. Their heads were grotesque, as if swollen and distorted. If I had seen only one, I would have thought it was a freak. But here was a whole school of the weird beasts facing us. I had seen a head somewhat resembling theirs on only one other fish—an abnormal-looking, artificially inbred lion-headed goldfish. But I knew these fish were not even distant monster relatives of any goldfish.

As they swam closer, we came up for air. "Are they dangerous? Can you spear one?" I asked Siakong and then quickly ducked under again to see how close they had gotten. Siakong gave me his usual reassuring look and then started swimming after them. In one movement, the whole school made an about-face and headed back for deep water. They looked less formidable going in this direction, and their tail ends were more fishlike than their monstrous heads. They had a fluffy look, as they once again blended into a light haze and disappeared—a herd of phantoms that Siakong could not catch up with.

Later Siakong told me he had seen these fish several times before and that once they had been fighting among themselves, butting with their heads. He had never succeeded in spearing one, but he believed they were very powerful fish.

Only recently I have decided these must have been a species of large wrasse, related to the group known as "sheepsheads," the adults of which grow fatty humps on their heads. While at the Red Sea, I saw a fisherman's photograph of a rare fish he had caught on a line. No one I consulted in Egypt could identify the fish, but it resembled the school I had seen in the Palaus. From my notes and descriptions, Dr. L. P. Schultz of the Smithsonian Institution believes the species to be *Cheilinus undulatus*. He once saw a school of these in the Phoenix Islands. They looked three to four feet long and re-

minded him of a flock of sheep. Those in the school I saw were easily this size. At the time, I estimated them to be between four and five feet long, although I may have been overly impressionable then, as many of us tend to be with "the fish that got away." Siakong didn't get close enough to them for me to compare notes with him. However, I have since examined many pictures of sheepsheads and have never seen any with head-swellings that approached those of the fish I saw with Siakong. I think they must have been exceptionally large adults to have developed such heads, if indeed they were any known species of sheepshead.

The same day that Siakong missed capturing this "mystery fish," he and Niraibui put on an underwater turtle rodeo. They were in a clowning mood. Siakong caught hold of Niraibui's foot and tickled the bottom of it until he had to laugh out all his breath. He almost drowned before Siakong let him rise to the surface for air. They were having great fun. Niraibui spotted a large sea turtle resting quietly on the bottom, and he latched onto its back. Then Siakong latched onto Niraibui's back, and they began taking turns knocking each other off the turtle and riding the bewildered animal around underwater. They could steer it any way they liked by holding the shell just behind the poor turtle's neck. If they pulled back, it would swim upward; if they pressed down, it dove; and leaning sideways would make it bank and turn. All the while, the turtle flapped its finlike legs and strained its long neck forward trying to get rid of the mischievous tormentors.

Finally they brought the turtle into the boat. Niraibui was pleased when I took his picture with it, and I promised to give him a print. I didn't know then that this would be our last trip with him.

A few days later I asked Siakong if we could get together with Niraibui for another fishing trip.

"I don't think so," he answered with a strange expression.

"What's the matter?"

"I think because he's dead," Siakong reported sadly.

The whole story came out later. Niraibui had spied some metal drums marked "alcohol" on a Navy truck. That was the one word he could read in English. The fact that the complete label read "methyl alcohol" didn't concern him. He punctured a hole in one of the drums, drank to his heart's content, and died.

His widow sold his boat immediately. There was no other motorboat I could get, and thereafter Siakong and I had to go to the reefs in outriggers. It took very long, and so we went only on Sundays.

As my weeks in the Palaus came to an end, Siakong asked when I would be back again. "Perhaps many years later," I said because I hated to tell him "Probably never." "That's O. K., Nechan. I'll still be a good spear-fisherman when I'm 80." And he might have, too; but that was not in the cards for Siakong. It was some time later that I learned what happened to the greatest spear-fisherman of them all. After being released from a long stretch in jail, Siakong went on a fishing trip, took a deep dive after a turtle, and never came up again. The area was combed by other divers, but they couldn't find a sign of him or a clue to his disappearance.

Perhaps with his great skill in the water, Siakong found a way to stay alive underwater indefinitely and just decided not to bother coming back to a world that was constantly throwing him into the calaboose. Let us imagine him still happily swimming around those reefs that he loved so much, playing with the turtles and fishes. Who knows what the story of his mysterious disappearance will be when the Palauan children of today tell it to their grandchildren?

This and other experiences from Dr. Clark's extensive travels will appear shortly in her book entitled *Lady with a Spear*, published by Harper Bros.



An Intimate View of

The Fish-Killer

By LYNWOOD CHACE

THE REFLECTION in one eye of this giant water-bug is of the cameraman, who is well able to take care of himself. But to a small fish or water insect, which is the usual prey of this formidable creature, the Fish-killer's close approach heralds sudden death. The Fish-killer catches fishes up to four inches in length, though it is only two and a half

inches long itself. It does considerable damage in fish hatcheries.

The Fish-killer has various other names, such as Electric-light bug (because it is attracted to electric lights) and Toe-biter (because it is supposed to bite the toes of bathers).

caused the damage, and in the earth adjacent to the walk I found a few other "buttons" of our delectable steak mushroom *Agaricus* — "the poor man's truffle."

A bit of rain, a warm sun, a germinating misplaced spore, the relentless growth urge, and — lo and behold — a tender, delicate mushroom had pushed up one-half an inch of pressed asphalt, to reveal its cap, unscarred, uncrushed, and only slightly compressed in a "well-rounded button stage." How it got under the asphalt is open to conjecture. The simple fact is that it did, and it got out from under.

THEODORE KAZIMIROFF

New York, N. Y.

Coldwater Geyser

SIRS:

On a trip through the West, I saw what was represented to be the only cold water geyser in the world. It was located about five miles south of Route 50 in Utah, at the end of a secondary

road that forked off a few miles east of Green River. My curiosity was aroused by this unusual spectacle, and I took the accompanying photograph of it. The stream of water, four to six inches in diameter, rose to a height of about 150 feet. We were informed that the spouting occurred at intervals of something over one hour. Unlike the more familiar geysers, the water of this one was cold to the touch.

Since steam pressure is the force that activates the usual type of geyser, I am curious to know whether you can explain the mechanism of this one. As I understand it, the geyser came into being when drillers were at work trying to reach oil.

PHILIP W. FLAGGE, M.D.

Fairhope, Ala.

We have the following comments from George D. Marler of the National Park Service, stationed at Yellowstone Park:

Dr. Flagge is correct in saying that the "geyser" he refers to is a result of drilling. And like him, there have been

many who were perplexed by the enigma of a geyser that has no steam to activate it. This example, however, is not the only cold geyser in the world by any means. Only a short distance to the north, as a matter of fact, there is another one, at Woodside, which is also on Route 50.

Natural geysers the world over are located in volcanic rock. They are heated by gaseous emanations arising from molten or extremely hot rock. In many places other than the one under question, man has developed artificial geysers as the result of drilling. Some of these drillings have produced hot water geysers, as at Calistoga, California. But in the case of cold water geysers like the one Dr. Flagge shows here, the pressure producing the eruption is from accumulated and trapped carbon dioxide gas, which forces subsurface water from the drill hole.

In most cases, the eruption of the geyser is controlled by a valve on the water pipe. One operated in this way is located at Soda Springs, Idaho. The ones mentioned above, however, show a natural periodicity. The explanation is similar to that given for hot water geysers. In both instances, the eruptions result from the building up of pressure of trapped gases. With the hot water geyser, it is steam; with the cold water geyser, it is carbon dioxide.

The "plumbing" for the two types, however, is quite different. In the hot water geyser, the tube is tortuous. Without structural impediments to retard or halt the escape of heat, periodic activity would not take place. Ground water is trapped in some twist or side chamber and changed to steam. This produces the pressure. In the cold geyser, the rising bubbles of carbon dioxide are trapped by ground water. When the gas sufficiently carbonizes the waterhead, the water starts to rise and flow from the tube. This release of pressure permits the greater activation of the dissolved gas and thus brings about the eruption.

In short, carbon dioxide is dissolved by the water above it, until the saturation point is reached. The pressure then pushes the water upward, and the eruption begins. This action of carbon dioxide gas in causing the eruption of a cold water geyser was explained in a recent letter from Dr. Arthur L. Crawford of the Geology Department of the University of Utah as follows: When the water begins to flow from the drillhole "the pressure is naturally released, and this in turn permits the more rapid release of carbon dioxide gas. Thus, you have what is essentially a reproduction of what happens in a beer bottle when you take the cap off and permit a sudden expulsion of gas from the liquid, which spurts to the surface, giving the geyser effect."





Lazy Man's Sport

SIRS:

Once there was a time when I thought it was great sport to grab a gun and slish through miles of wet pasture looking for game. Now, my weapon is a camera, and the game is insect life. This sort of hunting is very good, for the game lurks everywhere—in gardens, under rocks, around night lights. After

photographing something, it is always fun to dig in the library and try to learn its name. The best part of it is: it's an ideal sport for a lazy man who appreciates dinner at the table rather than smoke-smoldered, half-burned, half-raw food.

These pictures show three stages in the life of a moth. Perhaps you will like to use them for your Letters Page



and in exchange will tell me which moth it is.

Incidentally, NATURAL HISTORY Magazine has provided many solutions for the What-Is-Its.

JOHN R. CLAWSON

Wichita, Kansas

We are informed by Dr. Frederick H. Rindge of the American Museum's Department of Insects and Spiders that the moth is the Striped Morning Sphinx, *Celerio lineata Fabricius*. It is perhaps the commonest of the North American sphingid moths, ranging over most of North America, southward through the Antilles and Central America. — Ed.

Sharks in Canoe

SIRS:

John M. Olin in his article "Mother Mako" says, "Perhaps it is the only time an angler has ever taken eleven fish on a single hook."

Joshua Slocum in Chapter XII of his book *Sailing Alone Around the World* says of a shark he caught at Melbourne: "The shark was twelve feet six inches in length and carried a progeny of twenty-six, not one of them less than two feet in length. A slit of a knife let them out in a canoe full of water, which, changed constantly, kept them alive one whole day."

Very truly yours,

CYNTHIA MUIR

San Rafael, Calif.

Sugar Pines

Readers may recall the campaign that was initiated in the February 1948 issue of NATURAL HISTORY Magazine for the preservation of the Sugar Pines of Beaver Creek Valley. It is gratifying to be able to announce that an agreement has now been signed by the Pickering Lumber Company transferring the trees to the U. S. Forest Service. It is to be hoped that these unsurpassed trees will promptly receive the Forest Service's most rigid protection by being included within what is technically designated a Wilderness Area.



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Brief comments on films previously reviewed

Documentary and Grade A

The Alaskan Eskimo

The first in a series of films on people by Disney

What the Experts Said

Straight reporting on a single Eskimo community, where something of the old way of life survives

Bear Country

A Disney True-Life Adventure

Interest, drama, and continuity with a sound overall plan

Down the Alphabet

Brana Devil

3-D film based on Colonel Patterson's classic book about building an African railroad

Silly plot that does not follow book. Visual discomfort from glasses

Seminole

Somewhat distorted story of Second Seminole War with ideological overtones

Unpretentious, but new type of Indian picture in which the action interprets a constructive idea

City Beneath the Sea

Tenuously based on Port Royal, Jamaica, earthquake, 1692

A science fiction portrayal of underwater exploration. Little natural history

BOOKS *Continued from page 199*

philosophy or rationalization interferes with the narrative of an anecdote, and the action is scattered over several pages.

The things that happen are reported as eye-witness events and, extraordinary as some of them are, they call to mind similar almost unbelievable episodes in the experience of seasoned out-of-doors men. One or two of the Devoe anecdotes, particularly the one of the deer that took refuge from hunters on the Devoe sanctuary, seem to call for a bit more detail to be utterly convincing.

HAROLD E. ANTHONY

THE BIRDS OF AMERICA

- by John James Audubon, with a foreword and descriptive captions by William Vogt

Macmillan Co., \$8.95
435 pp., 435 illus.

THIS book was published as a quarto volume in 1937. Despite the high cost of the first edition, it sold in large numbers, and it was followed by a cheaper printing on less substantial and attractive paper. This, too, sold to an extent that would have been regarded as "enormous" by ornithologists and publishers of earlier generations.

The perennial interest in Audubon is indicated anew by still another edition of this same work, printed from entirely new plates.

The book is, of course, a treasure for those who are interested in either North American birds or Audubon. It includes, in the same order, all of the 435 plates that appeared in the double-elephant

folio of 1827-1838. Mr. Vogt's introduction to Audubon and his work is still one of the best brief statements that has ever appeared. His notes on the original plates and the transcript of the legends supply everything that a student of the history of ornithology needs to know about them, and they can here be consulted far more conveniently than in the giant and unwieldy volumes. On the reproductions of the plates throughout the book the original data have been replaced by the currently accepted vernacular and scientific names of all the species and by short and discriminating comments on the habitat, identification, nesting, voice, and food of each.

The book is so good and so useful that it does not need the printed advertisement around the cover—"Containing the finest color reproductions of Audubon's Birds yet produced!"—a statement that is simply not true.

R.C.M.

PHILIPPINE ORCHIDS

----- by Reg S. Davis and
Mona Lisa Steiner

The Williams-Frederick Press, \$5.00
270 pp., 111 illus.

THIS book will interest a rather limited number of readers since few plant lovers grow orchids or require information about them prior to the corsage stage.

But if one is thinking of growing orchids as house plants, *Philippine Orchids* describes some of the environmental conditions no sane person can duplicate in a human dwelling. On the other hand, some orchids are compatible with human companionship. One should

not be dogmatic in generalization about orchids because their range of tolerance and response to cultivation is so varied. What is particularly called for is more information of the very sort contained in this book.

The treatment of one hundred species, selected from the four hundred growing in the Philippines, gives a very good idea of some of the most beautiful and popular orchids and of the environment in which they grow. The half tones are helpful but, unfortunately, some lack detail; they are not up to the quality of the text.

HAROLD E. ANTHONY

THE FON AND HIS HUNDRED WIVES

----- by Rebecca Reyher

Doubleday & Co., \$3.95
318 pp., 32 illus.

THERE is scarcely an area in the world where polygamy has not flourished at some time, but in virtually all cultures where it does occur, it is apt to be confined to a small section of the population. Thus, in Africa, where polygamy is widespread, it is likely to be a prerogative of the chiefs or of men of wealth, while the great mass of com-

moners are obliged to be content with only one wife at a time.

As a social phenomenon, much has been written about polygamy. But there is relatively little on what it means in actual reality to be a part of such a system. Since we do not ordinarily hear much about the feelings of those whose lives are affected by it, we have come to assume that both the husband and his wives are reasonably content. As a result, however, of a story of African polygamy in which the suffering of the wives was emphasized by a Catholic nun engaged in missionary work in Africa, the issue of polygamy came before the United Nations. A heretofore obscure native chief in the British Cameroons, the Fon of Laakom, became the center of the ensuing international discussions and incidentally achieved notoriety in the press.

Mrs. Rebecca Reyher, author of a sensitive account of an African woman's life in *Zulu Woman*, determined to go to Africa to get the story that lay behind the news of the Fon and his hundred wives. Her book is an account of her experiences in getting at that story and the conclusions to which her investigations led her. In spite of its rather loose and somewhat repetitive structure, it is an interesting book with a decided and vigorous personality of its own.

HARRY L. SHAPIRO

Recommended and Otherwise

Titles and Authors

The Care and Training of Home Cage Birds

By Bernard Poe
Putnam's, \$2.50

Exploration Fawcett

By Colonel P. H. Fawcett
Edited by Brian Fawcett
Funk and Wagnalls, \$5.00

The Journeys and Plant Introductions of George Forrest

Edited by J. Macqueen Cowan
Oxford University Press, \$6.00

Plant Hunter in Manipur

By F. Kingdon-Ward
Jonathan Cape, London, \$3.25

The Scientific Adventure

By Herbert Dingle
Philosophical Library, \$6.00

Shorelands Summer Diary

By C. F. Tuncliffe
Macmillan's, \$8.00

Stars in the Making

By Cecilia Payne-Gaposchkin
Harvard Univ. Press, \$4.25

The Low-down

Considerable information about cage birds has been scraped together in this potboiler, written by a "professor of zoology" using the pseudonym Bernard Poe.—D. Amador

An interestingly written book, based upon the highly improbable existence of remains of "ancient cities" in central Brazil.—G. H. H. Tate

Prefaced by a short biography of Forrest and a chapter on his journeys in Yunnan and Szechwan, this book is devoted chiefly to Forrest's botanical discoveries presented genus by genus.—G. H. H. Tate

This account of collecting plants is written more for the scholar than the lay reader. The average dirt-gardener will encounter much outside his experience.—Harold E. Anthony

This collection of nineteen essays on the evolution and development of thought in science is excellent reading for serious thinkers; it is not light reading.—Harold E. Anthony

When a sensitive naturalist writes, draws, and paints extremely well, a charming product is inevitable. This beautiful book portrays life on the Welsh Island of Anglesey.—R. C. M.

A fine addition to the excellent Harvard books on astronomy by an eminent authority. Foremost thinking on concepts that are new and only slightly explored.—Joseph M. Chamberlain

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THE CORONATION JEWELS Continued from page 206

it secretly in his turban, which he constantly wore. When questioned, he professed enormous surprise that the stone was no longer in the eye of the peacock. But one of the women of the harem gave away his secret. She told the Persian Shah that the diamond was hidden in the Mogul ruler's turban.

With complex reasoning, Nadir made preparations for securing the jewel by subterfuge instead of force. He professed great friendship for the Mogul ruler, even restoring his kingdom to him. In celebration of this brotherly act, he set the stage with a vast banquet. During the course of the festivities, Nadir proposed that, being now brothers, they should exchange turbans as an expression of mutual trust and affection.

The Mogul emperor was in no position to refuse. The turban was no sooner in Nadir's possession than he left the banquet hall and in the privacy of his tent unrolled it. When the great diamond fell from its folds, Nadir, in rapture, is said to have exclaimed, "Koh-i-noor!" meaning "Mountain of Light!"

The stolen gem brought no good fortune to Nadir. When he took it back to Persia, he found himself in the midst of intrigue arising out of covetousness. Eventually he was murdered. His grandson, Shah Rukh, governor of the city of Mesha, inherited the gem.¹

Aga Mohammed, a lesser king, was one of those who coveted the Koh-i-noor. Determined to acquire the gem, he marched on the city of Mesha and demanded the jewels of Shah Rukh. He expected that the Koh-i-noor would be among them, but the Shah insisted that he had already disposed of the stone. At this, Aga Mohammed threatened to torture Shah Rukh. The Shah then gave up a large portion of his jewels but not the Koh-i-noor. He was turned over to the torturers.

They were thorough. They shaved the Shah's head, encircled it with a plaster crown like the sides of a kettle, and poured boiling oil into this receptacle. Under this agony, Shah Rukh parted with a famed ruby of his collection but still protested that he no longer had the Koh-i-noor. Aga Mohammed gave up. Shah Rukh still had his diamond, but he was permanently injured by his frightful experience.

The Koh-i-noor passed through the hands of various other potentates during the ensuing decades and was the incentive for additional bloody incidents. It made its way to the treasury of Lahore, and there it remained until it was acquired by the East India Company and presented by them to Queen Victoria in 1850.

After it was cut as a brilliant, Queen Victoria often wore it as a brooch. It was set in Queen Alexandra's crown, and the Cullinan diamond was mounted in the crown of George the Fifth, for their respective coronations.

One of the legends surrounding the Koh-i-noor is that it will not bring ill-luck so long as it is worn by a woman. Hence it has never been set in an ornament for a male member of the royal family.

Colorful indeed has been the history of these great stones. Idealism in varied forms has also been bred out of the bloody passions surrounding their earlier days. And it is salutary to remember that it is out of the bountiful heart of Nature that these Crown Jewels have come—this prodigal store of diamonds, rubies, emeralds, pearls, and amethysts that adorn the crown the new Queen will wear, the Orb that typifies her dominion, the scepter with which she holds sway and exercises spiritual gifts, the sword with which she dispenses justice, and the mace that symbolizes her authority. What other contribution to the crowning of Queen Elizabeth the Second of England can compare in richness and splendor with these gifts of nature?

¹ An alternate version of the story says Nadir Shah's bodyguard murdered him and took the stone to Afghanistan, where he founded a dynasty. See The Crown Jewels of England by George Youngs—husband and Cyril Davenport, Funk and Wagnalls.

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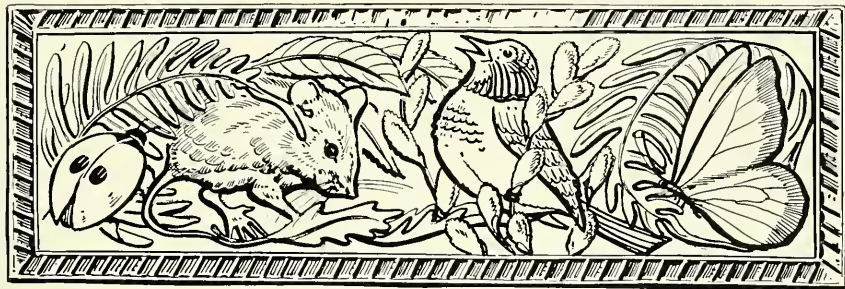
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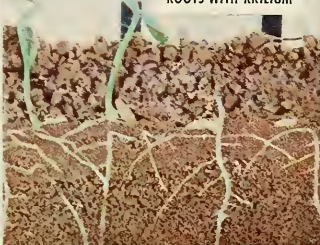


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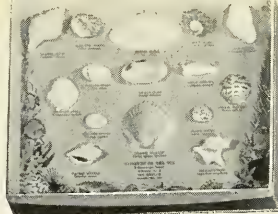
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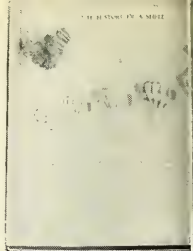
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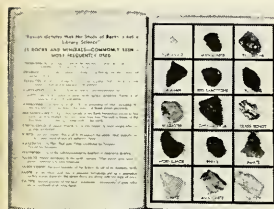


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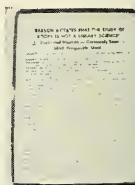
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LETTERS

Mushrooms and Pressure

Sirs:

The bursting of a thin asphalt pavement by mushrooms, well shown by Dr. Kazimiroff's photographs in the May *Natural History*, is a notable phenomenon. As owners of paved paths and tennis courts will testify, it is not as rare as many could wish.

There are several species of mushrooms, especially the shaggy-mane, *Coprinus comatus*, and *Agaricus Rodmani*, a close relative of the meadow mushroom, that seem to prefer compacted soil. The mycelium may be present in the earth and thriving for many years before a pavement is laid, without mushrooms being noticed or even present. Tamping of the soil, covering with asphalt, and rolling of the final surface, instead of interfering with the mycelium may even produce favorable conditions for its growth. And when the fruiting bodies—mushrooms—finally commence to grow, something has to give way, and it is usually the pavement.

The force exerted is a result of the absorption of water by the individual cells of the mushroom as they mature. Sunken concrete pavements are sometimes raised by pumping water and sand, under great pressure, into the foundation of the pavement. The mushroom exerts a comparable hydraulic pressure, with the results reported by Dr. Kazimiroff.

DONALD P. ROGERS

The New York Botanical Garden
Bronx Park, N. Y.

Seventeen-year Cicada

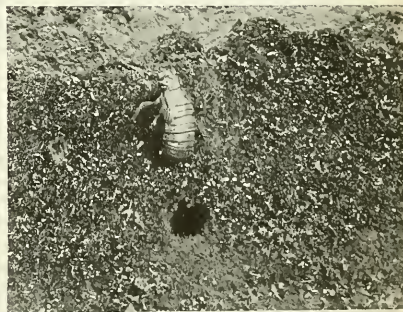
About the last week of May 1953, a large part of the eastern half of the United States from the Mississippi River to the Atlantic Coast and from Georgia north to the New England States, will play host to one of the most unusual insects known. This is the Seventeen-year Cicada, *Magicicada septendecim*. It is also called the Periodical Cicada. Many people also, but incorrectly, speak of it as the Seventeen-year Locust. The term Locust should be used only in connection with the Short-horned Grasshoppers.

For sixteen years and nine months the Seventeen-year Cicada has lived underground, growing slowly as it burrowed its way along the roots of trees pausing for long intervals to pierce the root bark and suck the sap. In April of its sixteenth year, it is full grown into

a one-and-a-quarter-inch creature. Leaving the nourishing root of its food supply, it digs in a fairly straight line up to the surface where it hesitates. If a stone is convenient it may excavate a chamber for itself while awaiting the final urge to a new life. Frequently, however, the nymph, for that is what the grubs of cicadas are called, will construct for itself a little turret or watch-tower of pellets of clay piled up and up on top of each other. The top is sometimes left open, but usually it is capped leaving only a small peephole on one side. The critical days will finally arrive this year, the last week in May or early June, and in the early mornings thousands of cicada nymphs will leave their burrows to climb some near-by weed or tree trunk. Ascending a foot or more the nymphs firmly set their claws and await the oncoming change.



Below: Full-grown nymph emerging from the ground. Left: Nymphs and emerging adults attached to tree trunk. Above: Female on twig after depositing her eggs. Top: Adult with wings expanded to show venation



They haven't long to wait, for the skin breaks down the back, and slowly and laboriously out crawls a most ungainly and anemic-looking creature, unlike what it will be in a few more hours when its iridescent wings are spread and the bright body markings of reds and greens are fixed. Many, however, will never reach this stage for the day may dawn hot and dry, and the wings will harden long before the circulating body fluids can properly expand them. The cicada is then doomed to crawl over the ground until it dies of exhaustion. Or perhaps a storm at the critical moment may dash

Continued on page 287

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Basically private capital has always backed any promising venture. But as the industry expanded even the most prosperous companies lacked enough hard cash for generating more power, stringing up miles of new wire and delivering current to millions of new consumers. So they went to the nation's banks for short-term loans.

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Usually, progress means profits, so banks have always competed with one another to put money to work in growing industries.

As long as competitive banking and free enterprise live under the same laws, the results will continue to be jobs for men and women, profits for both manufacturer and investor and a wider choice of fine products for all Americans to enjoy.

Mr. Edison's light is a good example. There are many others, and there will be many more.

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June, 1953

Volume LXII, No. 6

New Guinea Native in Feathered Headdress.....Cover Design

*From a color photograph made on the American Museum-
Armand Denis Expedition*

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to Periodical Literature in your library*



THE COVER THIS MONTH

A Chimbu warrior of the Central Highlands, New Guinea, in full dance regalia: torchlike plumes are flank feathers of the Greater Bird of Paradise; red and black feathers are Vulturine Parrot; black plumes are Black Cockatoo; black and green forehead shield is Superb Bird of Paradise. In the nose are two sets of crown plumes from the heads of two males of the bizarre King of Saxony Bird of Paradise.

This color photograph was made on the 1952 American Museum-Armand Denis Expedition. This party, together with another Museum expedition in 1950, dwelled nearly a year amidst these people. They are a mixture of Melanesian, Papuan, and Negrito. Some 75,000 live above 5,000 feet. Discovered in 1933, they are considered to be the most colorful and primitive of Pacific peoples.

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YOUR NEW BOOKS

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STRANGEST CREATURES ON EARTH

- Edited by Edward M. Weyer Jr.

Sheridan House, \$4.00
256 pp., 37 illus.

THIS is an excellent anthology compiled by a man who made good use of a great opportunity. In his many years as editor of *NATURAL HISTORY* (the periodical you have in hand at the moment), Dr. Weyer had the pleasure as well as the duty of reading innumerable articles on and stories about odd fish, remarkable insects, baffling birds, and queer creatures in general. For the most part, these articles and stories were written by experts in their fields, either professional scientists, accomplished amateurs, or practical workers in some division of natural history. With such material from which to draw for the compiling of an anthology, Dr. Weyer could hardly go wrong. In fact, it must have been an embarrassment of riches and the difficult job of the editor was to leave out many articles that he would like to have included in the book. The comforting thought is that he must have had enough left over to make another anthology of this kind, one that will furnish the general reader with interesting and at the same time authoritative information on the strange things to be found by land, sea, and air.

In this volume there is Paul Bulla's story of the remarkable migrations of the eels, Hugh M. Smith's account of the Archer Fish that brings down its prey with arrows of water, Alan G. May's biography of the elusive sea otter, Robert Cushman Murphy's soaring description of the life and high times of the Man-O'-War Bird, Willis J. Gertsch's exposures of the wiles of the lassoing and trap-door spiders, the tale of the four-eyed fish by C. Kingsley Noble, and thirty more offerings that are often amusing, sometimes amazing, and without exception solidly informative in some field of natural history. Most of the stories are illustrated by photographs and a few with drawings or diagrams. It's too bad that the illustrations, as a convenience in printing, are offered in four groups instead of having each photograph with the story it illustrates. The book has an excellent index. In fact, except for the missing of the illustrations, it's an excellent job in every way and should prove to the read-

ing public that the truths of natural history are stranger than the fiction of best-selling authors. And more entertaining.

JOHN KIERAN

EVOLUTION IN ACTION

----- by Julian Huxley

Harper and Bros., \$2.75
182 pp., 9 illus.

THE latest of Julian Huxley's many books began as a series of public lectures at the University of Indiana, was then adapted as talks on the Third Programme of the B.B.C., and is now issued in print. The reworking for popular audiences has produced a clarity astonishing even for Huxley in treatment of such a complicated subject so briefly. If you want a quick and easy view of modern evolutionary theory, this is a good book for you. The discussion is not only far shorter and simpler but also considerably better-rounded than in Huxley's earlier *Evolution, the Modern Synthesis*.

The book is more than a brief statement of evolutionary theory. It also develops a thesis: that the course of evolution shows progress; that man is the current acme of that progress, and that future progress will occur only through man and his descendants. That thesis has been expressed earlier, but here it is more fully integrated, and some previous objections are countered. A useful and interesting concept here developed is a distinction between improvement and deployment in the history of living things. Deployment within various levels fills the world with life, but improvement leads to new levels. Specialists may still question Huxley's opinion that only man is now capable of improvement, and they will also find some other less important points to argue. No one will question that Huxley's thought has been profoundly stimulating for the study of evolution and that presentation of its current status to the general public is a useful service.

"Only by getting some overall view of reality, in its dual aspect of self-transforming pattern and continuing process, can man hope to get a clearer view of his place—his unique place—in the process. And steer a better course into the future." Here is a contribution toward that superb aim.

G. G. SIMPSON

HIGH JUNGLES AND LOW

----- by Archie Carr

University of Florida Press, \$4.50
226 pp., 16 pp. of illus.

HERE is a book by a naturalist with literary ability. It deals with the plant life, the animals, the people, and occasionally with the politics and the history of Honduras and Nicaragua. It is in the nature of a miscellany, but with the accent on natural history.

Virtually the only way to really learn very much about the tropics is to live in them. When Dr. Carr was offered a job teaching in the school maintained by the United Fruit Company in the sparsely settled Yeguaré River Valley of Honduras, he realized that this was his opportunity. He promptly got a leave of absence from the University of Florida, where he was a Professor of Biology, and moved his family to Honduras. He spent week-ends and vacations from teaching scouring the country from coast to coast, by airplane, automobile, on horseback, or on foot. He studied tapirs in remote cloud forests on mountain tops, and sea turtles on islands off the coast. He joined a party making a survey of the timber in the virtually unexplored rain-forests of Nicaragua, where he hunted the agouti, paca, tapir, peccary, and deer to supply the expedition with fresh meat. But above all he was a naturalist with an interest in the flora and fauna—not merely as individual species or specimens, but as an integrated whole.

It is difficult to convey an accurate impression of the tropics for the same reason

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that it is almost impossible to describe the United States. For no two portions of it are alike. In Honduras and Nicaragua there are coastal rainforest, arid almost semidesert inland valleys, monsoon forests, gallery forests, cloud forests, salt water lagoons, and freshwater lakes, each with its own associations of plants, animals, and people. By virtue of his background, his intense interest, and more especially of his rare ability to recount his adventures with both gusto and understanding, Dr. Carr provides an impression that is both vivid and accurate.

This book is not written for the traveler, the scientist, the naturalist, or the politician. It is a book for everybody, whether he reads for reliable information or sheer pleasure. Dr. Carr knows whereof he writes—and he writes well.

C. M. BOGERT

THE UNDERSEA ADVENTURE

----- by Philippe Diolé

Julian Messner, \$4.50
236 pp., 29 photos

TO Philippe Diolé, the world under water represents the latest frontier. Man first conquered the earth's surface, both on land and sea, then the air above, and now another realm is about to be added to his conquest. It seems to be a most attractive one, and its winning will be much more pleasant than any victory that might be won over interplanetary space, for example. In fact, this book will make you want to don the mask and tank of compressed air that comprise the self-contained diving unit, and to invade the soothing, wonderful domain the author describes so well.

It is the self-contained diving unit that will largely make possible man's exploitation (in the best sense of the word) of the shallow waters of the sea, according to M. Diolé. Freed from heavy helmet, cumbersome suit, and restricting hose and line, the diver can maneuver about with remarkable ease and, above all, can enjoy his stay under the surface. A brief history of such diving is given, together with speculations on future economic and social developments and the possible effects of diving on the very nature of man.

M. Diolé has high hopes. He writes from a very broad, although not technically founded knowledge, and he is of

a refreshing philosophic turn. Although he may describe the love life of the lamprey in too lurid terms, he does not overdramatize himself or his own experiences. We even wish he had given us more of them.

JAMES W. ATZ

AMERICA'S ANCIENT CIVILIZATIONS

--- by A. Hyatt and Ruth Verrill

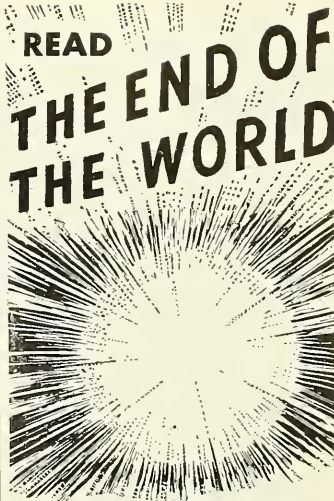
G. P. Putnam's Sons, \$5.00
384 pp.

JUDGING from the number of people who appear to have read Mr. Verrill's earlier book on the same subject (*Old Civilizations of the New World*, 1929), we can expect that this too will succeed in widely dispensing its confusing mixture of fact and misinformation about the progress of archaeological research in the New World and of the known history of the American Indian.

This reviewer is usually inclined to give a book written for general consumption the benefit of the doubt, so to speak, and not to express his adverse criticisms too harshly, but Mr. Verrill's expressed attitudes are too challenging to a member of the Archaeological profession to ignore.

One gathers from the book that most American archaeologists are extremely foolish people who haven't the ability to understand certain profound truths that are perfectly obvious to Mr. Verrill. To cite but one example, he makes much ado of how the archaeologists prove their incompetency by disagreeing in their interpretations of the dates given in the Maya hieroglyphs. It is true, of course, that such disagreements do exist, for the reading of Maya dates is an extremely complex matter and various unknown factors have prevented a certain correlation of the Maya and Christian calendars. Our author solves the problem by outlining in tabular form his own dates for the Maya Old and New Empires. He dates the Old Empire as from the earliest remains up to 350 A.D. and the New Empire from 350 A.D. to the time of the Conquest! These are apparently taken from thin air, for no sources or reasons for assigning these dates are given. They are, of course, completely out of accord with all the available evidence.

The book contains chapters on the



A Scientific Inquiry

By KENNETH HEUER

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KENNETH HEUER is a fellow of the Royal Astronomical Society, former lecturer at the Hayden Planetarium, author of *Men of Other Planets*.



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Mayas, the Aztecs, on the American food plants and on Coele, but the major portion concerns various aspects of the Andean cultures of South America. The last chapter, and a number of asides throughout the book, are an attempt to prove that the Andean cultures were derived from the Sumerians of the Near East. There is a very long and largely irrelevant bibliography.

GORDON F. EKHOLM

HEREDITARY GENIUS

by F. Galton

Horizon Press, \$3.75

THIS important book has been practically unobtainable for over 60 years. For this reason, scholars and the general public will rejoice in a fresh printing of it. Some students of the subject may take exception to the publisher's statement on the jacket that recent researches into family histories confirm its conclusions. A foreword by a modern student of this subject would have helped the layman to evaluate the book in modern science. In certain parts of the book, the author seems to be trying hardest to prove what is most evident, namely, that certain families in the England of his day produced considerably more than the average number of intellectually prominent persons. The important question seems to be whether this is due to heredity in the biologic sense as the author argues or whether "family advantage" in the broad meaning of the expression may not have played a greater part than he admits—E.W.

A GUIDE TO THE MOON

by Patrick Moore

W. W. Norton, \$3.95

249 pp., Lunar charts and Line drawings

IF you plan visiting the moon within the next half century, or even if you like to contemplate its wonders as seen from the earth, this book will fascinate you. The author, a recognized British lunar observer, has prepared a highly informative work on our satellite in a style easily comprehended by the layman.

Its seventeen chapters, plus the appendices, cover a vast amount of information concerning the moon's origin, its real and apparent motions, its surface features, its atmosphere, and many other topics of interest to everyone concerned with our nearest neighbor in space. Much of this material is new to the American reader.

The chapter called, "The Molding of the Surface," is particularly interesting to this reviewer because it supports the theory of the volcanic origin of the craters as opposed to the meteoric bombardment theory, most popular in this country. The author cites many arguments

in favor of the former theory that are not currently known to the lay reader.

Mr. Moore's chapter on "The Lunar Atmosphere" also makes fascinating reading, as does the one called, "Changes on the Surface."

This is a worthy contribution to literature on the moon and should be in the library of everyone with a general interest in astronomy. The book is thoroughly indexed.

ROBERT R. COLES

THE ORIGINS OF ART

by Gene Weltfish

The Bobbs-Merrill Company, \$4.50
300 pp., 99 plates

DR. WELTFISH has taken a title for her book that promises rather more than she delivers. But within the limitations of her subject, the influence of technologic process on design, she has brought together some extremely interesting material. In addition, she treats to some extent with the nature of diffusion and the influence of environment and cultural traits on design development. These latter phases are somewhat less satisfactory than the section on technology where her intimate knowledge of basketry techniques is at its best advantage.

The text is marred by occasional lapses of judgment, such as, for example, the juxtaposition of Dr. Weltfish's own highly proficient technical analyses of design from the Southwest presented with careful scientific documentation, with intuitive, personal interpretations elicited from her daughter.

Anyone interested in the nature of design will find much of great value in this book.

HARRY L. SHAPIRO

THE MANDARIN DUCK

by Christopher Savage,
with a foreword by Peter Scott

Adam and Charles Black, London (Dist. by The Macmillan Co., New York) \$5.00
78 pp., 17 pls., numerous text figs.

OWING to disturbed conditions in the Orient, where the Mandarin Duck has its home, this beautiful species is in a somewhat precarious position, at least in its wild state. It is fortunate, therefore, that the bird is adapting itself to a free-living existence in the English countryside. It has long been kept there, as elsewhere, as an aviary bird and now has managed to establish itself in some numbers in the wild. With suitable protective measures, its continued existence there should be assured.

This fortunate circumstance has facilitated observations on its life history under natural conditions to a greater extent

than has previously been possible in its native country. A discussion of such observations by the author and other observers occupies half of the present interesting volume.

The other half of the book is devoted to a history of the Mandarin Duck in Oriental art and literature, where it has held an honored place for many centuries, being held as a symbol of fidelity at least since 200 B. C.

The excellent illustrations show numerous examples of the artistic use of the bird in various media, photographs of the living birds, numerous sketches (by the author) to elucidate details of behavior and the like, and a frontispiece in color by Peter Scott. It all makes an attractive and informative contribution to our knowledge of a fine member of the duck family.

JOHN T. ZIMMER

FLYING SAUCERS

----- by Donald H. Menzel

Harvard University Press, \$4.75
319 pp., 96 illus.

FROM the inquiries received at the Hayden Planetarium, it is evident that flying saucers are a great mystery to many, even today.

In writing this book, Harvard's astro-

physicist, Dr. Donald H. Menzel, has performed a valuable service to these people by offering the scientist's interpretation. This is important today in view of the sensational books and articles that have recently appeared on the subject.

The author tells almost everything about flying saucers, from descriptions of early sightings to explanations of the probable true nature of similar phenomena reported at the present time.

There is no single explanation to account for all the odd sightings that have from time to time been erroneously described as "flying saucers." Among other things they include high flying jet planes, meteorological and other experimental balloons, reflections from material objects in the sky, searchlights on clouds, weather and astronomical phenomena, in addition to a variety of optical effects seen under strange atmospheric conditions.

Dr. Menzel describes all of these and many more in clear, nontechnical language that anyone can understand.

Aside from its value in explaining the flying saucers, this book is a genuine contribution to popular literature in describing many interesting astronomical and meteorological phenomena that any watchers of the skies may observe.

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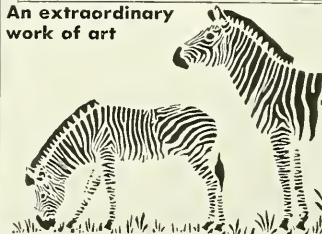
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AS I stealthily crawled up the steep forest track, my eye came level with a glistening little pool. At that moment, a man grunted so close to my ear I recoiled in fright. The sound came from the innards of a fagot of debris piled at the water's edge. Inside I made out a large blackish man lying on his side, his face hardly three feet from mine.

As he backed scowlingly out of the stick cage, I noted that the dikes of the pool were handmade and that a three-pronged arrow pointed ominously at the water.

This naked savage, it developed, spent many hours each day in this camouflaged trap, hoping for a shot at the fabled King of Saxony Bird of Paradise, wearer of the world's most unusual plumes.

The bizarre King of Saxony Bird of Paradise, *Pteridophora alberti*, had long eluded New Guinea's explorer-naturalists. For more than half a century after its strangely beautiful plumes first turned up in a shipment of fashion trappings from the South Pacific, the life history of this bird remained unknown.

My interest in the King of Sax-

ony Bird of Paradise had been sharply alerted early in 1949. I had just found I was to have a part in the ornithological exploration of the virtually unknown heartland of New Guinea. Dr. Ernst Mayr, ranking authority on the avifauna of New Guinea, told me then that the most fascinating challenge remaining on that great island was the discovering of the mating habits of this bird. Judging from the outlandish horns worn by the male, Dr. Mayr added, the courtship and display should be quite extraordinary and would be

Exploring New Guinea fo

A naturalist seeks out the dazzling King of Saxony, possessor of the world's most beautiful plumes, and witnesses for the first time its courtship dance, performed at a dizzying height



of great interest and real scientific value.

He assured me that the bird occurred only in the most inaccessible mountain ranges in the interior of New Guinea. Although various expeditions had brought back specimens, nothing was yet known about any aspect of the life history of the species.

Shortly after reaching New Guinea in April of 1950, I had the good fortune to meet Captain Neptune Blood, famous New Guinea bushman and Bird of Paradise collector. Blood told me the King

of Saxony lived in lofty mountain forests blanketing the Bismarck Mountains, high above Nondugl in the 5000-foot Wahgi Valley, where we were at the time. This range comprises the median part of the great central divide that splits New Guinea from end to end for 1500 miles. It is in the region formerly held by Germany but now under mandate to Australia through the United Nations.

This region made front-page news throughout the world when, in 1933, a daring gold prospector named Michael Leahy first entered

it and found a vast population of Stone Age people living in a "lost" valley.

Blood called in a scowling dark-skinned Kanaka named Pondo who, he said, could tell me about the bird. Through him I found that the King of Saxony—"Kisaba," he called it—had special dancing limbs in the top of the forest. The birds visited these limbs daily to carry on in the most brazen manner their polygamous affairs.

The long crown plumes, he informed me, were then in molt, and I would have to wait many weeks

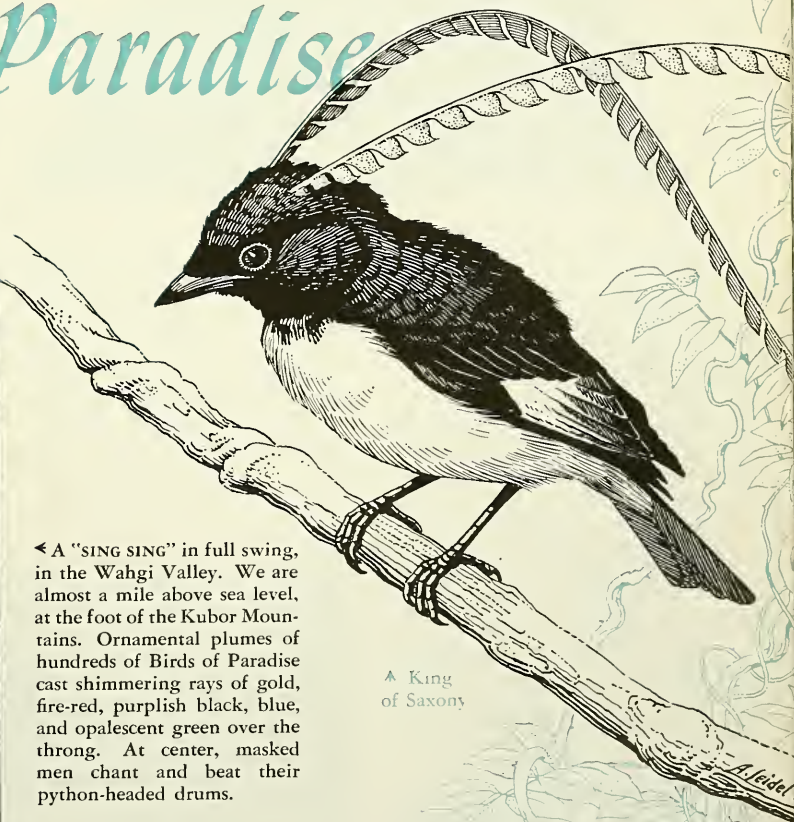
Birds of Paradise

By

E. THOMAS GILLIARD*

Assistant Curator of Birds,
American Museum of Natural History

Photo by American Museum-Armand Denis Expedition



◀ A "SING SING" in full swing, in the Wahgi Valley. We are almost a mile above sea level, at the foot of the Kubor Mountains. Ornamental plumes of hundreds of Birds of Paradise cast shimmering rays of gold, fire-red, purplish black, blue, and opalescent green over the throng. At center, masked men chant and beat their python-headed drums.

▲ King
of Saxony

* The author led the Museum's 1948 and 1950 New Guinea expeditions, the primary objects of which were to collect exhibition material for Whitney Memorial Hall and to obtain scientific specimens of rare and little-known birds. In 1952, accompanied by his wife, who is an artist, he again visited the Central Highlands of New Guinea, this time as Manager of the

American Museum-Armand Denis Expedition. The primary purpose of this venture was to study and photograph New Guinea birds, particularly Birds of Paradise, and to make a film of the primitive people. He is planning now to head another expedition to New Guinea for the American Museum later in the year.

—Ed.



Photo by E. T. Gilliard

◀ A CHIEF in the region where the 1950 party visited a large population that had rarely seen white people. This is in the Omong River Valley. The chief's neck is adorned with the fur of a marsupial called a *Kapul*. He carries a ceremonial ax. A parrot wing headdress of yellow and red surmounts a skull cap of cuscus fur. A crescent of mother-of-pearl serves as his nose ornament

for the new ones to grow. From this you will see that my good fortune concerning this bird was largely due to the generosity of the Captain and his assistants.

A month later, while on a junket in the Wahgi Divide of the Bismarck Range, my guide suddenly froze in the trail, turned under the barrels of my elevated shotgun, and whispered, "Kisaba."

Pointing to the crown of a distant tree, which stood like a sentinel above the wet cloud forest, he repeated the name as though with relish, then cautiously led me up a steep slope to a point level with the crown limbs. As we crept through the thick vegetation of the forest floor, being careful to avoid

the paralyzingly painful nettles, we followed the course of a tiny mountain stream, nearly dry now, for this was late May. To my unpracticed eye, it appeared that something or someone had frequently come this way, and this struck me as strange, considering how far we were from any native artery.

It turned out that we had stumb-

led onto the trail used by the hunter in the fagot of sticks who, shortly thereafter, surprised me as I clambered up to his hiding place beside the tiny sparkling pool. The man had formed this enticing drinking spot so that it would be visible from the tree in which the King of Saxony Bird of Paradise had been heard singing.

One hand on my shoulder, the other aimed at a spire of dead limb rising far over our heads and well out over the gorge, my guide pointed directly at a satanic bird—a creature with unbelievable horn-like plumes, which flashed a blue

Photo by E. T. Gilliard



➤ DEPARTURE for the high ram-parts of Mt. Wilhelm, highest peak in the Territory of New Guinea. Father William Trepper bids good-by to E. T. Gilliard as the party sets out from Kegalsugl to scale the summit and collect birds above the tree line. Several white men recently lost their lives in the Chimbu Gorge in the background



Photos by American Museum of Natural History-Armand Lems Expedition

▲ Three views of a King of Saxony Bird of Paradise on his dance perch 90 feet up. Seen through a 400mm telephoto lens mounted high in a tower 8,000 feet above the sea: 1) He silently watches every movement in the forest, snapping his head, expanding his golden chest, drooping his jet wings, thrashing his glittering plumes; 2) Suddenly he

rears back, his green mouth wide, his body pumping, and sends forth a penetrating "kisssss-aaaa-baaa" audible half a mile; 3) Following the love call he pirouettes, postures aggressively, leaps up and down, expands his black velvet cape, and awaits the approaching female

fire in the sunlight. I fairly gasped at the sight.

Thus it was that I saw my first King of Saxony as it snapped its ornamented head about in reckless abandon, examining every movement of the forest crown, which spread like a lawn at his feet. He was indeed a king, it seemed.

Turning again I saw that the trap of this huntsman consisted of a bow and three-pronged arrow, which was even then cocked and

ready to fire by means of an ingenious trigger.

Word had gone out that Blood would pay a small fortune in shells and beads for the King of Saxony alive. However, careful examination of the three-pronged arrow convinced me that the native would probably kill the robin-sized Kisaba when finally it landed within range of his primitive weapon. This would make little difference to the huntsman because, dead or alive, his prize was rare and valuable

in the native economy. Of one thing we could be certain: if he was anything like the stealthy, patient huntsmen I encountered elsewhere in the Central Highlands, he would eventually spring his trap and his shot would not miss.

Among the local inhabitants of the Wahgi Valley—and there are said to be more than 75,000 of them—flank plumes of the Greater Bird of Paradise, cape and chest plumes of the Superb Bird of Paradise, immensely elongated tail plumes of the Sicklebill, the Stephanie, and the Ribbon-tailed Birds of Paradise are highly regarded for purposes of adornment and also are very valuable as trade money.

The crown plumes of the King of Saxony, however, are among the most prized and most valuable. Each is about eighteen inches long,

Photo by E. T. Gilliard



◀ THE AUTHOR at the head and Robert Doyle at the end of the line of carriers in the Kubor Mountains. The party has just emerged from the cloud forests in the background with a valuable collection of Birds of Paradise and mammals. In 103 days of bush travel, 1500 study skins of 180 species of birds were collected, 23 new to science



Photo by E. T. Gilliard

▲ THE CHIMBU people are polygamous. A bride can be bought with four to eight pigs, plus four "things." A thing may be a ceremonial ax, a tree-climbing cuscus, a set of Paradise plumes, or the like. Heads of households have from one to eight wives. Men and boys live separate from the women

➤ THE AUTHOR and his collectors lived in these pandanus houses for four days while hunting rare mountain birds at 8500 feet in the Kubor Mountains. This bird is New Guinea's largest eagle, *Harpyopsis novaeguineae*. Six birds new to science were shot within a mile of this camp in this zoologically unexplored cloud forest

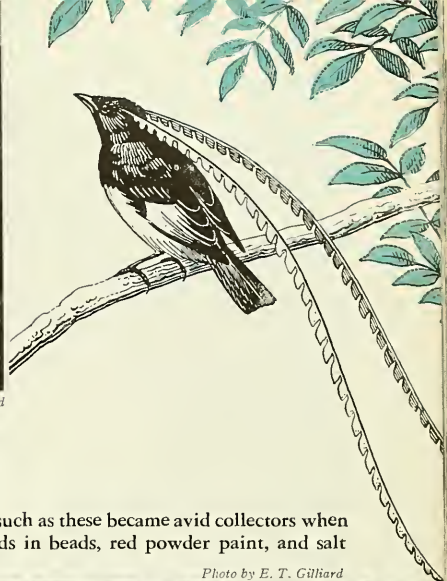


Photo by E. T. Gilliard



Photo by E. T. Gilliard

▲ DOYLE AND GILLIARD at camp above tree line just under the peaks of Mt. Wilhelm, to whose summit they carried the Explorers Club Flag No. 126



and they are decorated along the outer side of the quill with a saw-edge of large, waxy, sky-blue flags. The plumes are worn only by men high in the hierarchy of each clan, and then only on occasions of special importance, such as marriage ceremonies and at large dances or sing-sings. The tremendous quills are fastened to the native's nose and forehead in a sharp sickle-like curve. With this colorful adornment on both sides of the head and framing the cheeks, the savage's countenance becomes quite impressive, particularly in concert with his other regalia of glistening gold-lip shells. This usually includes a crown of carefully stitched tambu cowries and a vertical headdress consisting usually of a flamelike mass of Greater Bird of Paradise plumes, spiked generously with owl and parrot wings or up-ended tails of the Lesser and Stephanie Birds of Paradise. Occasionally, too, there are skins of Golden-crested Bowerbirds and Superb Birds of Paradise, the latter flashing like a jewel with each movement of the wearer.

The long undiscovered King of Saxony sitting so cockily above me, I later found, remained on and about the crown of this tree for periods of up to an hour each day. When sitting still, his crown plumes curved upward like fragile whips from just behind the eyes to a point some three inches above the velvet-

▼ MEN, women, and even children such as these became avid collectors when word got around of the rich rewards in beads, red powder paint, and salt

Photo by E. T. Gilliard





◀ THE ASH-GRAY and white Queen of Saxony carries a spike plume in lieu of the giant wax-blue crown plume of the male. After mating she carries out all duties of nest building, incubation, and care of young, while the promiscuous, polygamous male continues to make new conquests

*American Museum of Natural History-
Armand Denis Expedition photo*

➤ THE AUTHOR points his 400mm telephoto still camera and 152mm moving picture camera on a dancing Greater Bird of Paradise. On the ground is a portable tape recorder with which calls of several species of Birds of Paradise were recorded

✧ THE WAHGI VALLEY, 20 by 60 miles, is home for 75,000 people. Though hunting is practiced, 95 per cent of all food is raised in gardens such as the one seen on the steep slope at left. The expedition was able to purchase sugar cane and bananas shown here with rock salt

Photo by E. T. Gilliam





American Museum of Natural History-Armand Denis Expedition photo

➤ **SIX DIFFERENT BIRDS** make up this headdress. On the forehead, a green metallic shield glistens like a medalion in front of a velvet-black cape of feathers, both from the male Superb Bird of Paradise. The huge "shaving brush" is the golden crown of the rare Gardener's Bower Bird. The black top piece is from the Stephanie Bird of Paradise. Many men bear scars of tribal warfare. One with a spear through his middle miraculously survived and joined the author's entourage as a carrier



American Museum of Natural History-Armand Denis Expedition photo

black of his partially caped back. From there they draped symmetrically downward across the basal edges of the tail to a point four to six inches below and behind the tail tip. As I watched, the head moved in my direction and the bird seemed to peer at me. To my dismay, when I crept closer, he dived into the thick forest beneath the display perch, his egg-yellow breast hardly discernible.

Thus, in the southern watershed of the Bismarck Mountains at an altitude of 7500 feet on May 20, I saw my first living King of Saxony. His perch had been a limb near the top of a 100-foot tree growing on the side of a steep-walled canyon, a position of commanding view which, like a stage, could be watched from afar.

In the months to come, I came upon eight males of this species on their dance perches, all of which

were located in deep forest between the altitudes of 6500 and 8000 feet.


On the twenty-seventh of July, 1950, I had the good fortune to make color moving pictures through a six-inch telephoto lens of one male in the act of dancing. While these photographs are not of quality sufficient for popular exhibition, they provide us with a visual document of the heretofore unknown courtship performance. To our great elation, we found, upon examining the film in New York, that unknown to us, a female had entered the dance scene.

I carefully recorded what I saw that day between 4:00 and 5:00 P.M., at 7500 feet above sea level, in a subtropical forest on the south slope of Mount Hagen. The male King of Saxony elevated the head plumes in a wide V until they tilted forward like slender horns and

drooped to a point level with the feet but perhaps 12 inches in front of the bird. Then the bird began a rhythmic dance, which consisted chiefly of an undulating or bouncing of the body. This took place some 50 feet above the ground on a thin horizontal perch, perhaps of finger thickness. Claspings the perch tightly, the male made crouching movements that caused the slender limb to spring rapidly up and down some six inches to a bounce. As the tempo increased, the velvet black cape gradually expanded until it overhung the shoulders and forward halves of the wings. During the bouncing, which lasted perhaps a minute, the bird bowed his head a number of times in a manner that caused the spectacular twin-occipital plumes to be cast forward and down like the tines of a great fork.

While this activity was under

Continued on page 287



◀ If you have visited Florida, you may well have passed an anthill like this one without suspecting what marvelous activities a little patient observation would disclose. The edge of the Harvester Ant's nest is ringed with a dense growth of plants. These probably result from seeds accidentally dropped by the ants

Consider the HARVESTER ANT

It harvests grain like any provident farmer
and after wet weather dries it on the roof in the sun

By ROSS E. HUTCHINS

State College, Mississippi
All photographs by the author

ONCE each day the sun sweeps westward across the peninsula of Florida. In the southern portion, its path leads across the confused and endless ways of the Everglades to the mangrove swamps of the western coast. To the north, its course is across the pine and palmetto scrub, the home of the panther and the rattlesnake.

This region of sandy soil is also the home of *Pogonomyrmex*.

Pogonomyrmex badius is the species of Harvester Ant that thrives in this place of sun-parched sand and scanty vegetation.

Here, spring is a time of awakening just as it is in more northern regions, and the sparse plant growth again pushes up out of the thin, sandy soil and clothes the brown waste with green. The colony of the Harvester Ant beside the Apalachicola River has easily survived the winter's rains. With the approach of spring, the inhabitants have extended their paths away from the underground nest through the ant jungles of short, herbaceous plants. The feet of thousands of hurrying ants have made these tiny highways well defined and easy to follow with the eye.

The grain bins of the Harvester

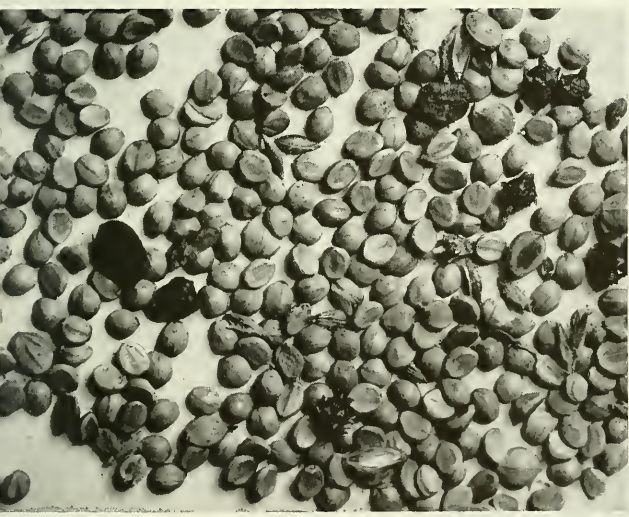
Ants are empty now. The fall store of seeds has been consumed or has rotted during the dampness of winter, and the ants are forced to forage upon what they can find. Ten feet from the entrance to the nest is a palmetto, and in its shelter grows an assortment of plants that are producing early seeds. The ants are busy harvesting these seeds and carrying them down the highway to the colony. These seeds are transported, husk and all, to the underground passages of the nest, where they are husked and stored in bins in the upper chambers just beneath the surface. The ant-hill is dome-shaped and raised above the surrounding sand. Thus the grain bins are well above the moisture level. Here the stored

seeds remain dry, because the sun shining upon the dome of the nest drives the dampness away.

The husks that are removed from the harvested seeds are carried up out of the nest and discarded on one side of the hill, where a pile of chaff accumulates. This is their kitchen midden. Now, it is an interesting fact that a little circle of seed-producing plants is almost always found growing about a colony of Harvester Ants, and this has given rise to the pretty story that these ants not only harvest grain but also plant it. It is disappointing that we cannot say that the ants plant and cultivate their crop of grain-producing plants. Careful studies have shown that this just isn't so. The circle of plants about



▲ THE WORKER ANTS gather the seeds and carry them, husk and all, into the nest. There they husk and store them



▲ CLOSE-UP of a spoonful of "grain" after the ants have husked it in their nest. It is chiefly grass seed



➤ AFTER THE ANTS have husked the seeds, they carry the husks out of the nest and discard them in a pile at one side of the hill. This close-up shows the husks of various seeds



▲ GRAIN BINS of the Harvester Ants. In underground chambers like these, the ants store their "grain" for future use.

After a rain, they take the seeds up onto the roof of the nest and dry them in the sun. (Photographed in an artificial nest)

the nest results from accidentally dropped seeds and from sprouted seeds that have been brought up out of the grain bins and discarded.

Deeper within the underground passages are the dark nursery chambers where the young ants are being reared. These chambers are moister than the ones above, where the grain supply is stored.

The Harvester Ants are polymorphic, that is, they are of several types. The workers of most ants are all of one kind, but the Harvesters are unusual in this respect. If you examine them closely you will see that there are several

sizes, and now and then there is a very large kind with an enormous head. It has been said by some authorities that these ants, the workers major, constitute the miller caste, that they break the flinty seeds with their powerful jaws for the other ants of the colony. Be that as it may, they do have great heads equipped with jaws that certainly should be capable of cutting up hard grain. They, along with their smaller sisters, have wicked stings that make them dangerous to other small creatures of the piny woods.

Daily the ants labor in the sun,

gathering their stores. The little trails leading away into the scrub are teeming with seed-laden workers returning from foraging expeditions. But there comes, at last, a day when the sun no longer shines and late spring rains sweep through the barrens. All the creatures of the forest seek refuge according to their habits, and the Harvester Ants cluster together in their underground tunnels. The rain falling upon the dome of the nest tends to run off, but some of it soaks through the roof and the precious grain bins become saturated. If the rains should continue for too

long, the grain would begin to sprout and be rendered useless. Even when the sun drives away the rain clouds and the sand of the barrens becomes dry, the grain bins of the Harvesters are still saturated with moisture. The seeds will soon sprout if something is not done. But this is an age-old problem and one with which these ants have developed the instinct to cope.

With the reappearance of the sun, the worker ants carry the seeds up onto the roof of the nest where they dry, and then they

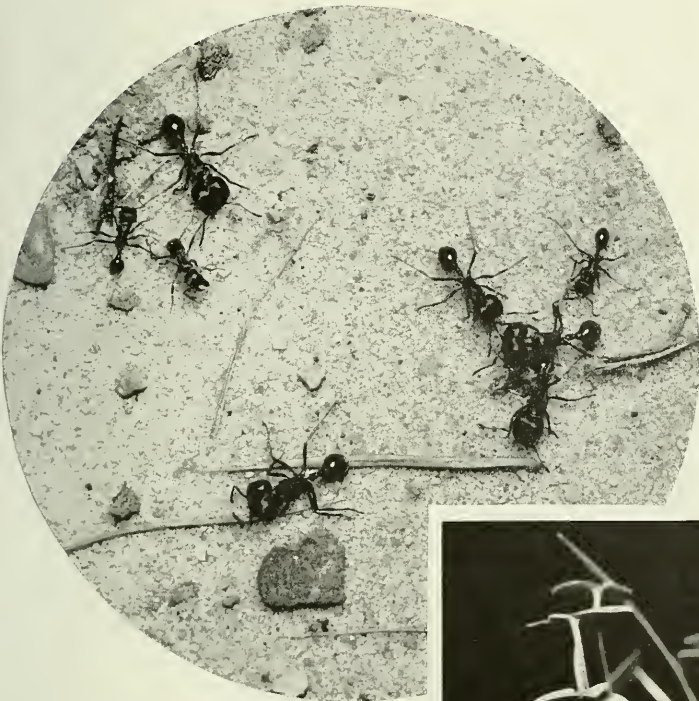
return a large part of it to the bins. Simple, but it must have required a long time to develop the instinct to carry out this elementary procedure.

Weeks pass, and the hot breath of summer sears the pine barrens. Occasional breezes sigh through the long-leaf pines and rattle the dry, fanlike fronds of the palmettos. The Harvester Ants seldom stir above ground now but remain deep in the dark, cool lower chambers. Young queen and male ants are being reared meanwhile. Soon

they will become mature, emerge from the nest, and mate. The males, their role fulfilled, will die, but the queens will choose likely sites and found new colonies—if they have survived the dangers of the mating flight.

Time passes, and the sun no longer shines with its full intensity. The nights grow longer and cooler. Instinctively, the Harvester Ants begin harvesting seeds from the maturing grasses and small legumes of the scrub. These are carefully slucked and stored, and soon there is a sizable heap of chaff beside the anthill. The bins are full, but the busy ants work feverishly, driven by the blind urge of instinct to accumulate more stores, even when no more are necessary.

On a near-by bush, a green katydid saws out its monotonous dirge, unmindful of the Harvester Ant's industry. It neither knows nor cares that winter is near and that it soon will die. Its mission in life was accomplished when the female laid the eggs that are the guarantee of a fresh generation of katydids to sing on future summer evenings. The Harvester Ant, on the other hand, must store food, for it must live throughout the winter to continue the work of the colony when the earth grows warm again under another summer's sun.



▲ HARVESTER ANTS are polymorphic, that is, the workers are of different sizes and types. Both the large-headed "miller caste" and the small-headed types are shown here

►IT HAS BEEN SAID that the ants cut out the germ end of the seed to prevent sprouting, but this photograph casts doubt on the statement. These plants grew from seeds taken from the grain bins of the Harvester Ants





▲ BEHOLDING the ancient columns of the Giant Forest, one gazes upon the ages, the very imponderables of existence. Yet if smaller creatures are not overlooked in one's admiration for such grandeur, their importance in nature's scheme becomes apparent.

FORESTERS of the Sequoian Groves

Most visitors to Sequoia National Park are so spellbound by the Big Trees that they do not notice these other denizens, upon whom the giants depend for their existence. In these photographs you can meet them intimately in a way that is rarely possible on the spot

By JOHN L. BLACKFORD

All photographs by the author

IN the shadows, upon furrowed trunks, on needle-padded forest floor, and in the towering evergreen-top of the most stupendous grove in the world lives an elfin community of wildlife without which the Sierran giants themselves would perish. Here in Sequoia National Park, as elsewhere in nature, the marvelous and complex interweave of life pattern and habitat shows every winged and four-footed "forester" playing a part in relation to all the rest.

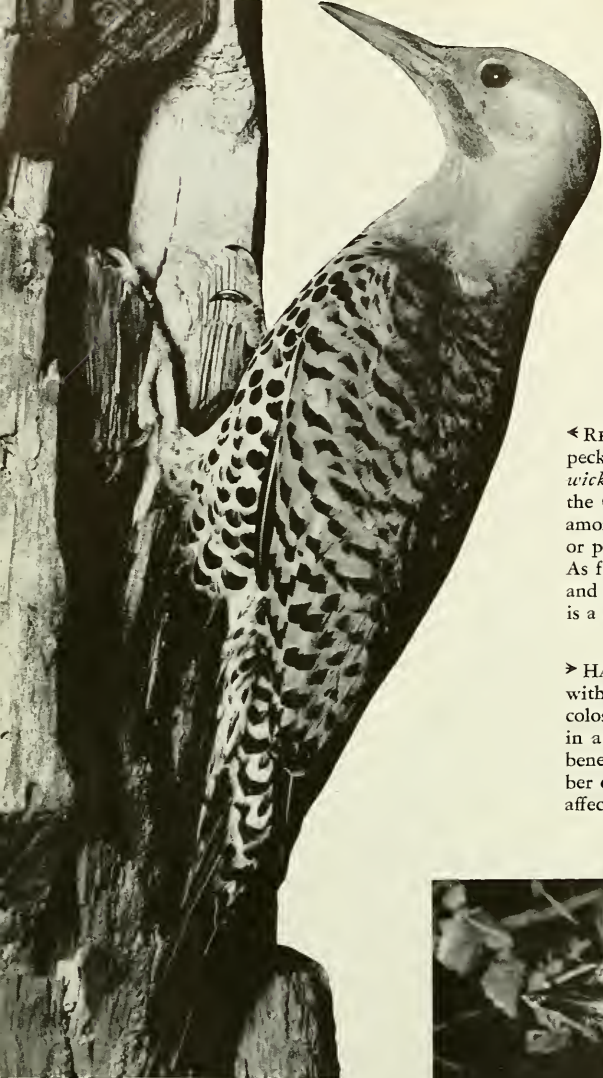
This famous Park, continuing and enlarging upon the concept of natural areas to be set aside in perpetuity for all of us and our descendants, was the second National Park to be so dedicated, and it is noteworthy that it was established to protect and preserve *living* things.

The idea of National Parks, first inspired by the scenic wonders of Yellowstone, has spread over the globe. But it was the Sequoias that brought the realization, after centuries of exploitation, that life in other forms than man can be beyond price.

Standing literally like columns in the Temple of Time, the immense sequoias of Giant Forest rival or surpass the life spans of all other living forms. Yet these Big Trees of the Sierra, which stood and prospered in matchless grandeur while

► THE GOLDEN-MANTLED GROUND SQUIRREL reforests many a rockslide with his "planted" seedlings. He looks and acts so much like his striped cousins as to be called the Big or Golden Chipmunk. But his colorful stripes reach only to the shoulder instead of to the end of his inquiring nose, as with the true chipmunks





civilizations rose and fell, are intimately dependent upon their associated plants and animals. They cannot live without the infinitely smaller winged, furred, and bacterial lives that flourish with them—or that perish when their habitat is materially disturbed.

It is this vital story of nature's delicate balance—of the interdependence and interrelationship of all the plants and animals making up a distinctive *life community*—that the sequoias of Giant Forest

◀ **RED-SHAFTED FLICKER.** This handsome, friendly woodpecker is familiar to most of us through his jovial *wickawicka* and his engaging presence about our dooryards. In the Giant Forest he seems a different character, as he darts among the tremendous red-brown boles of *Sequoia gigantea* or plunges arrow-like into the vast canyons of the Kaweah. As feathered ant-eater, grasshopper, hunter, acorn gatherer, and wild-berry harvester, his impact upon his environment is a most beneficial one

➤ **HART OF THE SEQUOIAS:** a handsome California Mule Deer buck with new horns in the velvet, reclining at the buttressed base of a colossal Big Tree in the Giant Forest. What part does a deer play in a sequoia's lengthy life? His browsing controls the undergrowth beneath which Big Tree seedlings take root. Nor is there any member of a life community that does not, in life or death, in some way affect the organic chemistry of its living associates

➤ **BLUE-FRONTED JAY:** an alert watchman of the woods, who warns many creatures of danger. Occasionally he becomes a predator. All life in some way holds other species in balance. When the crested jay hides acorns in the soil, he becomes a forester. An eater of wild fruits, he sows their seeds. He carries cones about and distributes the evergreens. He is a clown, a wit, a servant of the forest, a thrilling adventure in wild beauty



can tell us. It is because of biological harmony and adjustment between every living form in this mighty forest that the Big Trees maintained health and strength through the millenniums and attained their venerable age of around 4000 years. Here, too, in these cathedral corridors of Time, is the secret for human happiness—for man cannot achieve lasting security until he again finds a harmonious relationship with his natural environment.

Modern man's most successful attempt to understand and reveal biological relationship—the science of ecology—is more than a science; it is an exciting adventure into the living world. In Sequoia National Park, a few steps from pavement, you are lost in that world. The varied Sierra Montane Forest broadly girdles the mid-elevations of California's Sierra Nevada. Islanded in this expanse of Ponderosa, Jeffrey, and Sugar Pine, White and Douglas Fir, Incense Cedar, and Black Oak

are the occasional massive groves of sequoias. Half of them, perhaps 5000 Big Trees, are preserved in Sequoia National Park; and nearly half of these tower together in Giant Forest. Their burly crowns thrust 300 feet into the Sierran blue. Paleobotanists say their kind are survivors from the remote ages of giant reptiles and mammals.

Such is the home of Sequoia's varied and intriguing wildlife, the furred and feathered foresters of this mighty Montane wood.





◀ A CALIFORNIA SPOTTED OWL taking a daytime nap in a young white fir growing between the four giant sequoias of The Cloister. Rodent control is the specialty of this rare, beautiful, and beneficial bird. Thousands of years ago, the skillful nocturnal work of his silent-winged clan may have saved these forest giants from winter girdling when they were seedlings

▼ THE SIERRA CHICKAREE, a geographical race of the Douglas squirrel. This spunky little "for-ester" clings to the bole of an incense cedar as he "steals" nuts and acorns from the cameraman





▲ NO **TIMBERLAND** could long endure without the constant check placed upon its teeming insect population by hungry birds. A professional in this class is the Northern White-headed Woodpecker, strikingly marked guardian of all the mighty Sierran conifers. He is a characteristic Sequoian, frequently seen in flash-winged flight among the huge pillars of the forest



▲ **AMONG** the intricately interwoven life patterns in the Giant Forest, the Stephens Fox Sparrow specializes in the efficient inspection of forest duff and surface topsoil. His kicking legs and sharp eyes unearth and detect countless creeping and squirming forms. His appetite controls their numbers. To those who know them, the loud rich songs of the Fox Sparrows spell the inexpressible lure of the wilderness



➤ **PICKER AND SEEDER** of wild berries and fruit, this female Sierra Grouse helps maintain the floor and understory of the montane wood. Her precocious downy brood place a heavy check upon fast-multiplying insect life. The budding of conifers by wintering grouse thickens the new growth—just as does a nursery man's budding and pruning. No game bird should be "harvested" to the point where it cannot fulfill its vital role in the delicately balanced natural world



◀ THE ADAPTABLE WESTERN ROBIN is a familiar Sequoian, and his carols are inseparable in our memories from the montane groves. Extensive range, abundant varied insect diet, and frequent broods of young—all make him an important contributor here, as in any of the widely differing biotic communities where he is at home

▶ THE CREEPER, whose days are passed in specialized work upon tree trunks, is an obscure but important life-link in the chain of arboreal survival and growth





◀ **BLACK BEAR.** His tearing apart of old logs and stumps in search of beetles, grubs, and ants hastens forest decay. The soil is "cultivated" during his digging for roots, bulbs, and burrowing animals. In return for these and many other services in Nature's scheme of things, he enjoys an unexpected pleasure in the forest. The "Bear's Bathtub," a rain-filled cavity hollowed by fire from two huge sequoias joined at the base, is patronized regularly by an approving ursine clientele

▶ **THUS** the trails leading into the sequoias disclose a magnificent forest wildlife society. Its delicate balance has been achieved through the adaptations of many creatures and thereby perpetuated for untold thousands of years



SCIENCE and the Indian

IN January, 1952, Allan Holmberg, Professor of Anthropology from Cornell University, guided the oxen that pulled a plow across a field on the Hacienda Vicos up in Peru's beautiful Callejon de Huaylas, literally the "alley lane," running between the Black and the White Cordillera of the Andes. He fertilized the overworked land with the country's own guano and planted wheat.

Dr. Holmberg, who grew up in a small town in Minnesota's farmlands and knew plowing long before he knew anthropology, is put-

▼ **THE PLAZA** of Hacienda Vicos, the heart of the 18,000-acre tract where the experiment is being conducted. A view before reconstruction

A. Guillén photo



▲ **WHEN CORNELL UNIVERSITY** and the Carnegie Foundation became interested in the community, the Hacienda had fallen into disrepair and become public property. Cornell rents the Hacienda for \$900 a year, and Dr. Allan Holmberg (hatless) directs the program. Next to him here is Dr. Mario Vásquez, the spokesman of the project among the Indians. At right is Humberto Ghersi, who is studying the mestizo community at Macará for his doctorate

➤ **GLEANERS** in the potato fields after the harvest. Application of modern agricultural methods for only five months produced a potato crop that alone paid most of the rent

A valley high in the Andes is a living laboratory for a group of anthropologists who want to help a primitive community grow modern gracefully

By HAZEL O'HARA

ting sweat, sunburn, and aching muscles into an effort to make the Hacienda Vicos pay off in advantages for the Indians who live on it. Working beside the Indians, with his sun-bleached crew haircut and blue eyes behind rimmed glasses, he shows his Swedish ancestry.

Early in June, I took a photograph of three of the blond Hohnbergs in the wheat field. Six-year-old Anna was sitting on her father's shoulder, and three-year-old David was astride the neck of swarthy Enrique Luna, the administrator of the hacienda. The yellow wheat

shimmered around us. Dr. Hohnberg, reaching down to touch the crisp grains affectionately, remarked that the land was yielding double the wheat it had been giving.

The Anthropology Department of Cornell University, with the help of a grant from the Carnegie Foundation, rented this hacienda on January 1, 1952, and started a five-year experiment in applied anthropology under the direction of Dr. Hohnberg. This and three other experiments — in Thailand, India, and southwestern United States —

have been launched by Cornell as something new in anthropological studies. Hitherto, studies have been made for the laudable purpose of adding to the world's knowledge. Applied anthropology, like applied psychology, is designed to aid the person studied. The object in Peru is to help the Indians make the transition into modern-world economy.

The Cornell experiment has the blessing of Peru's Institute of Indian Affairs and the friendly collaboration of its Director, Dr. Carlos Monge, and of other important

A. Guillén photo



officials in the Ministry of Labor and Indian Affairs.

The Callejon de Huaylas was chosen for the experiment because it has a population of Indians who live to themselves in their old primitive patterns but are facing a period of economic development.

The Callejon is surely the most glorious "alley" in the world, the kind of place in which even an altitude-sick traveler would like to rise for a stanza of some hymn to creation. A condor of the Andes down on the coast for a vacation among the pelicans would consider the trip back a short one, for he would simply fly high over the Black Cordillera, and there he would be floating across a fresh hilly valley toward the cake-icing of the White Cordillera. For those of us who go on wheels, it is 250 miles from Lima to Huaras—around 10 or 11 hours.

We ride up the coastal desert for three hours, then turn inland toward barren hills that soon turn into the mountains. The car climbs steadily, and at times we can see six loops of our zigzagging road below. We wind endlessly up and up through the labyrinth of mountains, emerging from barrenness into pasture lands and steep fields and roadside decorations of wildflowers.

As we round a curve to a passage blasted through rock, the driver says, "This is Incahuacanca (Where the Inca Wept)," and slows up so that we can see skulls in a niche with the remains of candles, which the faithful have burned there. Presently he says, "We're over the Black Cordillera," and we see before us the first frosted giant of the White Cordillera.

Conococha, the little brown community sitting on the crossing, is a sad place alone up here in the Andes, higher above sea level than the summit of the Matterhorn. A man standing on a heap of stones, hands in pockets, woolen scarf wrapped around his neck and mouth, gravely contemplates the car. From a placid lagoon, the

river Santa moves off in a leisurely escape, giving no hint that it will later shout and tumble and provide the makings for a great hydroelectric project. As we start down the plain toward Huaras three hours away, those engagements for next Friday in sophisticated Lima glimmer in our memory like ghosts.

We are now in the old mountain kingdom of the Incas. Three-quarters of all the people in Peru live in the so-called Sierra, only one-quarter on the coast or in the jungle. Over 45 per cent of the country's people are pure Indian, and about the same number are mestizos—mixed Indian and white. From the moment the traveler encounters the pure Indians of the Sierra, he realizes with compassion that he is among a people who have been caught in a harsh historical process.

It's the same feeling that hit me when I went touring in our own Southwest and suddenly encountered those brightly dressed wandering Navajos, whose ancestors lost out in the Conquest.

Peru has a much bigger problem than we have, because there were more Indians to start with, and they had a highly developed civilization. The many evidences of what they were keep history alive and pricking today. A traveler in the Andes sees tiers of barren agricultural terraces and irrigation ditches built by the competent engineers of the Inca kingdom.

It will be a sad day for color film when the picturesque Indians of the Sierra climb into store clothes. But for all their bright dramatic costumes, they tug at our sympathies, for they are obviously at the low end of the economic scale. Men and women both turn to alcohol for surcease and recreation.

Such is the problem that history has precipitated. Peru is struggling with it, but she is handicapped by lack of money. The Indian Congress held in 1949 at Cuzco brought together educators, anthropologists, and other specialists from both South and North America to

consider the Indian. The government has welcomed the Cornell experiment because it is an attempt by social scientists to put a group of Indians on their feet. It may turn out to be a demonstration of how to bring the Indians into the national life.

The Peruvian Government hopes to bring industrial development to this valley and is behind the hydroelectric plant on the Santa River. Peru has a growing population and a perfectly fantastic geography from which to feed them—desert, towering mountains, and jungle, so she must increase her productivity and her national income. Small industries seem to be the answer.

Dick Patch, of Columbus, Ohio, has been studying the Indians in the present industries of the Callejon. He is tall, fair, and slow-spoken, and he has a slight stoop that makes him look scholarly at twenty-two. The amoeba gave him dysentery, and then jaundice hit him and he had to go down to Lima for hospitalization. But after several weeks, he returned and continued his studies through the dreariness of the rainy season in the high altitude. He visited the hydroelectric works, sawmills, furniture and rug factories, and other industries, to determine how the Indians change when they come down from their hillside homes to work in industry. What do they do with their small farms? Do they bring their families with them? Do they stop chewing coca? Do they learn Spanish?

This field work gives Dick the basis for his doctorate at Cornell. "When I get my degree, I'm coming back to the Callejon," he said in making his farewells.

His study helps to define the Indian's response to an industrial life and will be helpful later in the development of small industries on the hacienda.

In contrast to wandering Dick, Bill Stein has stayed put for nine months in the Indian village of Hualcan. He learned Quechua at Cornell in preparation for this investigation. A big bronzed man in

➤ THE SNOW-CAPPED summits of the White Cordilleras, which look down upon the remote valley where the future greets the past



◀ SEMINAR, with Dr. Holmberg presiding. The talents of the crew who are applying their energies to the plan range all the way from agricultural know-how to social and psychological aids. Plans include extension of health facilities

▼ WIVES AND FAMILIES are part of the scientific community. Here are Anna and David Holmberg and friends

A. Guillén photo

his early thirties, he had two years before the mast as a boy of sixteen. Among other things, he is evaluating the receptivity or resistance of the people to outside influence. This he should be able to analyze feelingly in his doctoral thesis, for the Indians didn't want him there at first and turned against the family that took him in.

To round out his study, Bill went down to one of the sugar haciendas on the coast, where religious obligations often bring his Indians to recoup their finances. When a man's turn comes to be major-domo of a big religious festival, he may have to go deeply into debt to play the part fittingly. He regards his





◀ AFTER THE FIESTA. Recreational facilities of the Indians are being studied, also the use by the Indians of coca and alcohol

▼ THE OLD CHAPEL on Hacienda Vicos. In its heyday 100 years ago, the estate had a family in residence and Mass was held on sundays

debt of honor so seriously that he goes away to work and saves almost every centavo of his wages.

The project needs comparative information on the social structure of pure Indian villages and villages that are mestizo. Humberto Ghersi is studying the mestizo community of Marcará for his doctoral thesis at the University of San Marcos. Marcará, six kilometers from the Hacienda Vicos, is the nearest gateway to the outside world. The Indians come to Marcará to attend Mass and take part in festivals. They bring their eggs and cheese to market. And they get drunk in Marcará.

Bill Mangin started his study of alcoholism and coca-chewing in Marcará. He is a tall, wavy-haired Irishman from Syracuse who was in the Navy for three years and spent his G. I. money studying anthropology in the Yale Graduate School. He stays at our pension when he is in Lima, and I shall always remember him as he stood one evening, shirt a little baggy in front, thumbs tucked into his belt, crooning *Cool, Clear Water* over a long Englishman shrinking into a deep armchair. The Englishman had complained that the record of this song had been missing for days, and Bill, who considers the piece corny, said he would be glad to oblige with his own rendition. In full tremolo he began, "All day I paced the barren waste without a taste of water," and went on to



the end, though we all begged, "Stop, Bill, you're breaking our hearts."

I asked him how he happened to join the Cornell experiment, and he answered, "Oh, I just went in one day to see a guy at the Museum of Natural History about Peru." Bill has Vera and fifteen-month-old Laura, but they were willing to take a chance on the Andes, if that was where he wanted to go, so he shopped around for funds and secured a grant from Cornell University and the Social Science Research Council.

He is finding out how much alcohol and coca the Indians are using, and why. The traditional

explanation of coca-chewing is that it takes away hunger and gives energy. After studying a group of 40 Indians whom he could have under observation all day during potato harvest, Bill found that when given the choice of coca or bread, most of them would take the bread. As I made a note, Bill, the scientist, said, "Now don't write that they have all sworn off coca. The study only indicates that the chewing of coca is not necessarily a vicious habit that cannot be overcome by a stimulus of greater value, such as food."

Bill is acting field director of the project during the nine months from September to June, while Dr.



▲ A SPECIAL OVEN for making bread for All Saints Day

► THE CEMETERY is a social place on All Saints Day



Holmberg is teaching his alternate year at Cornell.

The Holmbergs and the Mangins live in the old house on the Hacienda Vicos, the 18,000-acre heart of the Cornell experiment. Some 2250 Indians occupy dispersed homesteads over this big and rugged area. The hacienda saw its heyday perhaps 100 years ago, with a family in residence and Mass in the chapel on Sundays. It has long since been public property and rented to the highest bidders, who have farmed some 500 acres for what they could get out. Cornell now rents the hacienda for \$900 a year.

The Indians traditionally gave in exchange for their homesteads 3 days of labor a week to the hacienda without pay, except for a *gratificación* of 20 centavos (U. S. \$.013) for the purchase of coca, and this arrangement is continued. They had also been called upon for much free service as cooks, grooms, and the like, but are not asked for such labor under the project.

The Indian families have lived pretty much on their own, and they remain primitive. They have become more and more isolationist

as the place has run down and lost its center of interest. The Indians received no agricultural assistance. When the experiment was started in January, 1952, they had not been getting their *gratificación* for a year. There was no health service. The chapel was closed. The little adobe school was going to pieces, but the 15 or 20 boys who showed up could fit into the dusty, dim porch.

Only perhaps a dozen of their number can read and write, and most of them speak only Quechua. Their morale is low, and they lack unity unless it be in resistance to outside influence. We outsiders can guess this resistance from their faces. Many of those faces are fine, the kind seen on old coins, but they are conservative people, and our presence there probably seems completely reasonless.

Anyhow, that's the setup for the anthropologists. Mario Vásquez, a Ph. D. from San Marcos who grew up in the Callejon, is the voice of the project among the Indians. He has explained to them that the foreigners are interested in improving the place and are putting all profits back in so the people themselves will benefit.

Mario lives with an Indian family in the hills. His day is often started at 5:30 or earlier by a man asking him to settle a quarrel, or a woman seeking medical help for her husband.

My first visit here was early last June. We drove between the crumbling adobe walls into a big bare area that forms a kind of plaza, and I saw a tall cross leaning against the closed doors of the old chapel. The brown of the adobe structures and the crumminess of the walls make a sad first impression. The house, however, was turning white under the painters' brushes, and it had an obviously new wooden veranda across the second story.

The walls in the Holmberg's apartment upstairs are a soft green and have niches for books and dishes. There are rugs of Indian design and old pottery of the pre-Inca civilizations on the stone mantel and deep windowsills. Dr. Holmberg explained how simple it is to make a niche or a closet for clothes in an adobe house. Just take a knife and carve the size opening you want and then paint it. There's an opening with a shelf between the kitchen and dining

room which enchants the Indian boy who helps with the meals.

One job of the anthropologists is to teach the Indians how to do the work they ask of them. Anthropologists are generally resourceful, and Dr. Holmberg is no exception. Twelve years ago, he headed into the deep jungle in Bolivia to spend eight months with no mail and no travel agent around the bend to make arrangements for crossing rivers alive with crocodiles. Out of this study, done on a grant from the Social Science Research Council, came his report *Nomads of the Long Bow*. When the war broke out, he went into economic warfare for the U. S. Embassy, later switched to the Rubber Develop-

ment Corporation. He met Laura Hines at the Embassy, and since their marriage he has "settled down" as he calls it.

Laura Holmberg is also capable. "I never saw a woman," said one of her friends, "who can so easily park a baby on her hip and start across the Andes Mountains." Eric is only two, but tow-headed Anna and David run around among the laborers and have picked up a real vocabulary of Quechua, which unfortunately will not be intelligible this winter in Ithaca.

Dr. Holmberg led us out to see the crops. Three Indians trotted past us, faces half hidden under the big sacks of seed potatoes they were carrying to the shed. The kit-

chen gardens were large enough to provide produce for the hacienda, including a hot plate for the school children, and bring in about 150 soles (U. S. \$10) every week from sales to people who walk up from Marcará. The Indians on the hacienda follow their old diet of potatoes, corn, and beans, with a little meat when they can get it, but some of them have begun to toy with the vegetables. They have learned to eat cabbage but refuse the turnips. Dr. Holmberg had enlisted an American nutritionist in Lima, and he was coming up in a few weeks with some aides to make a nutritional study of the population. "After that," said Dr. Holmberg, "we'll know better how to improve their diet."

Jumping the irrigation ditches, we went down to visit the wheat field and the future orchard, where 250 peach trees were on the way up.

One big job to be done on this hacienda is to stop erosion. In the six months since the hacienda had been taken over, 200 eucalyptus trees and 500 pine seedlings had been set out, and the Indians were beginning to buy pine seedlings at



A. Guillén photos

► **SIGNS OF MODERNIZATION.** It is hoped that modern agricultural techniques can revive the seriously eroded farmlands and support an up-to-date agricultural community. Electrification in the valley will soon stimulate industrial opportunities for those who want to "leave the farm." Thus the students of history and of the arts of living hope to ease an ancient people quickly through several thousand years of sudden transition

BUILDING the terrace for the new school. Local labor suffices. Attendance in the old building jumped from 20 to 60 in three days when school lunches were started. There is a dream of a much-needed medical clinic. Ninety-nine per cent of the populace proved to be infested with an average of four different intestinal parasites each



one sol (U. S. \$.06) to plant around their own homesteads. Trees are so scarce in this high, hilly region that evenings in the hotel near Huaras I uneasily eye the armful of firewood that the boy brings in to give us a little warmth while we wait for dinner.

No wonder the soil runs away. The patchwork fields on the sky-scraping hills of the hacienda are more vertical than horizontal. "They use ladders to plant some of those fields," Dr. Holmberg said. The Indians are being encouraged to revive their old agricultural art of terracing, abandoned since the Conquest. By clearing the stones from the hillside and using them to build retaining walls, they have added 25 acres of erosion-free farmland by terracing.

An agricultural engineer of an inter-American agency known as SCIPA comes from Huaras, 16 miles away, one day a week to help with the plans, which include rotation of crops, introduction of better varieties of seed, development of pasture land, improvement of cattle, use of insecticides, and preparation of seed beds from which plants will be distributed to

the Indians. The hacienda procures fertilizer, seed, and wool for weaving, which the Indians can purchase at cost.

When I was there early in June, the project had been running only five months. The one big profit so far was the 9000 soles (U. S. about \$600) they had cleared on the potato crop. The actual profit had been 18,000 soles, but half had to go to the former renters who had put the potatoes in. The grain, which had been put in since the first of January, was expected to clear another \$600 or so. In one month (March) small sales made on the hacienda amounted to a little over \$100.

Their first piece of construction is the new school. Attendance had jumped from 20 to 60 in 3 days when school lunches were started. And three girls, miniatures of their mothers in their costumes, now show up regularly in this man's world of letters.

On the hillside behind the school, I watched some 20 workmen laying the foundation for a building to accommodate 200 students. They had blasted out the embedded boulders and were using

them to build a retaining wall. As we stopped to look at this thing of strength and beauty, Dr. Holmberg remarked that the Indians love to build stone walls. The workmen will make all the adobe and tile needed for the building.

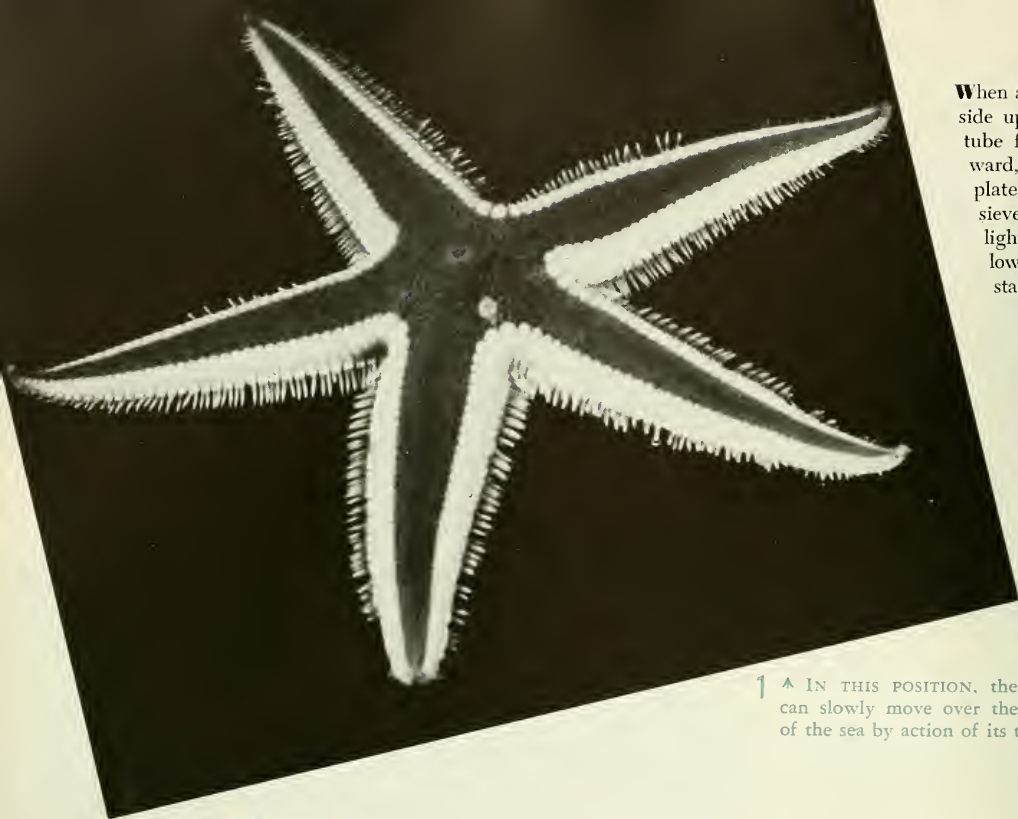
Gustavo Tode, a Lima architect, became interested and drew up plans for the school. It will perch in two levels upon the steep hillside, with a front nearly all glass—a wide-eyed edifice in this region of blind buildings. There will be an auditorium for both day and evening use. "If the next potato crop is good enough," someone remarked, "perhaps we can get a projector this year." Two or three acres will be cleared for school gardens and another area for an athletic field; and beyond *that*, Dr. Holmberg sees a pleasure park with trees and running water.

It occurred to me as we walked and talked that I never once wondered, "Just why is he doing all this?" I knew. He is doing it because he likes to. I have had to use the word primitive to describe the Indians' society because it lacks certain tools, techniques, conveniences, and habits of thought that are characteristic of our modern world. But the word primitive should not suggest that the anthropological project is afflicted with a superiority complex. The visitors regard themselves quite properly as self-invited anthropologists who have this interesting opportunity to try out their science in helping a people to adjust to a changing environment.

We looked over a crumbling wall at a field of boulders the men would dynamite next to prepare for a clinic. Dr. Holmberg isn't worrying yet about how to get a medical staff. The friend with me, a nurse, remarked, "Now *that* is something I would like to do," though before our eyes was only this rocky ground.

Dr. Holmberg gladly pulls in anyone who can help. One day a doctor traveling for a U. S. drug company stopped by. Holmberg and he had by chance known each

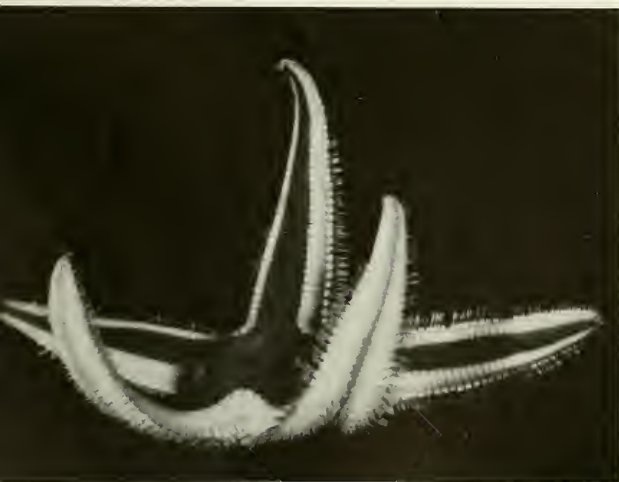




When a starfish is right side up, its mouth and tube feet point downward, and its sieve plate is on top. The sieve plate is the lightish disc just below the center of the starfish shown here.

1 ▲ IN THIS POSITION, the starfish can slowly move over the bottom of the sea by action of its tube feet

A Starfish Rights Itself



7 ◀ ... You describe it

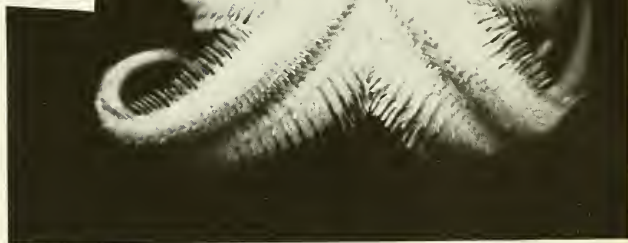
6 ▼ ... oh, well ...





2 ▲ IF YOU TURN the starfish over, you can see the tube feet—fringing each side of the radial canal, like flowers bordering a path

3 ► THE STARFISH soon curls its arms backward in the first maneuver to right itself



4 ► REACHING the tip of one of its arms farther back than the rest, it works its center of gravity into a position where. . .



5 ▼ THE UPPER SURFACE is beginning to come uppermost. Then



A photo sequence

By KURT SEVERIN



▲ THE UNIVERSITY OF MICHIGAN's blizzard camp atop Great Sitkin volcano in the Aleutians. Near this ice

field, a small colony of rose-purple orchids were growing not more than five feet from the ice

DURING the four years in which our expeditions have explored the Aleutian Islands, we have often made our headquarters at military bases, where we tried to help the soldiers and sailors to know and appreciate the natural wonders of their lonely outposts. A surprising number of men showed an eager interest in the flowers that cover the Aleutian meadows and windy heath slopes every summer. When the men came with plants for us to identify, they invariably brought one in particular in which they seemed most interested—a small plant with rose and purple flowers.

When we told them their specimens were orchids, they were amazed. Later each G. I. collector would carefully press his orchid between the pages of a *Blue Jacket's Manual* or a mystery magazine, and the next letter home was almost sure to announce with all of the seriousness attending a report of a new scientific discovery: "Guess what? There are orchids growing in this hellhole. I mean real orchids!"

Orchids of the Tundra

Some G.I.'s in the North saw more orchids than their pals stationed in tropical regions, and the Aleuts even serve orchid tubers for dinner

By THEODORE P. BANK, II

Botanical Gardens, University of Michigan

The little orchid that impressed our G. I. friends would be one of the most gorgeous flowers on earth if only each blossom were as large as the more commonly known orchids offered for sale in American florist shops. The Aleutian orchid, however, is a small plant that stands only six or eight inches high. Its tiny flowers, of which there are a dozen or more, are arranged in a broad spike, and the color of its petals varies from pink to rose with purple or russet spots.

The flower has no odor at all, but anyone who sees it growing among the rugged and forbidding gray rocks of the tundra quickly comes to appreciate the delicate touch of beauty it lends to an otherwise bleak terrain. Certainly it has pleased the fancy of many a disconsolate soldier.

Frequently we were accompanied on our field studies by local G.I.'s who found in our overland treks an interesting and adventurous way to spend their off-duty

hours. Some of these boys became truly expert amateur botanists, and they performed a valuable service to our expeditions by helping to collect plants. Others also contributed to our studies but more by accident. I especially remember a tall, lanky Oklahoma boy, a machinist's mate in the Navy, who discovered an orchid we hadn't expected to find in the central Aleutians.

He casually mentioned one day that he knew where there was a plant we didn't have in our collections. Somewhat dubious, for we had been thorough in our searches, we climbed into a jeep with him and drove across the tundra as far as we could go before the ground became too steep. Then we footed it after our long-legged guide into a beautiful green valley that faced the Bering Sea. Stopping on a high

bank overlooking a cold, rushing stream, he pointed with satisfaction to a boggy, flat place near the water.

At first we saw only clusters of buttercups and rose-purple orchids, but then our attention focused upon several scattered plants that were different from the others. Each had a single flower with a large, inflated sac that hung down like the lower part of a pelican's beak. The sac was cream-colored with brown spots, and the two green leaves on each plant were also spotted brown, giving a rather weird appearance. It was a lady's-slipper (*Cypripedium guttatum*). In some parts of the United States it is very common, but it had not been known from the Aleutians except on islands close to the Alaskan mainland.

We were delighted with the find

▼ THIS is the rose-purple orchid (*orchis aristata*) that was most commonly seen by the servicemen in the Aleutians. This plant was about eight inches high and was growing near a mountain stream



▲ A CLOSE-UP of the spike shows the tiny but beautiful rose-colored flowers with purple spots on their petals

and congratulated our beaming colleague from Oklahoma. He then told us that he would have shown us to the spot sooner except that he had figured we were kidding when we told everyone we were in the Aleutians to collect flowers. "Fer gosh sakes," he said, "I thought your posy picking was just a cover-up for some sort of secret work you were doing." We gravely informed him that grown men actually did spend their time looking for plants, if they happened to be botanists.

The rose-purple orchid and the lady's-slipper are not the only orchids to be found in the North. Our Aleutian servicemen, and indeed most persons, are surprised to learn that many different kinds of orchids have invaded the colder regions of the world. There are thirteen kinds in the Aleutians, and more occur on the mainlands of Asia and North America. One of my favorites is the majestic white orchid (*Platanthera*), of which there are many species in Alaska. One kind with greenish-white

flowers arranged in a tall, slender spike emits one of the sweetest perfumes in the Northland. Then there are the delicate mist maidens (*Spiranthes Romansoffiana*), the long-bracted orchids, the tway-blades (*Listera*), and the coral roots (*Corallorrhiza*)—all northern members of the large and expansive orchid family.

Not only do these seemingly delicate plants survive in arctic and subarctic regions, but I have come upon them growing next to snowbanks. It is almost as though the orchid family were trying to prove its hardiness! However, we usually find them growing where they are protected from the high winds and watered by drainage from hillsides. Frequently they occur next to streams, where their leaves and flowers are sometimes bathed by the spray.

Once we discovered the rose-purple orchid during an ascent of an active Aleutian volcano. Our expedition was camped on the rocky, cold slopes of Great Sitkin peak, and we were preparing for an attempt to reach the crater 1000

feet above us by traversing the glacier that surrounded it. As we made our way among the rocks along the lower margin of the glacier, we came upon a small community of orchids bravely enduring the rigorous environment of ashy soil bordering a towering cliff of ice. The plants were stunted, to be sure, but seemingly healthy. We were intrigued with their situation and looked about for other communities, but search as we would we could locate no other orchids closer than 100 yards in a protected ravine. The first group were truly pioneers.

The following day we were presented with the apparent paradox of the same species growing in the opposite temperature extreme. While descending the mountain, we found another little group of these orchids snuggling close to a boiling hot spring below the active volcanic crater. One was reminded of the ballad "The Cremation of Sam Magee," for these hot-spring orchids looked as if they were really warm for the first time since they had come to the Aleutians.

The Aleutian natives, called Aleuts, recognize the different types of orchids growing on their islands and have native names for them. During one of our visits to an Aleut summer camp, we noticed an old lady seated on the ground scrubbing the soil from some fleshy, white tubers that looked familiar. She called them *chagittkas* and led us to her tent where she produced a jar full of them. They were from the white orchid (*Platanthera*) and are gathered in August, washed well, and boiled like potatoes. They have a sharp, almost peppery taste, but the Aleuts say that in the old days, before the introduction of the white man's potato, the people relied upon them. For some reason, the Aleuts do not consider the rose-purple orchid to be edible, although it, too, has fleshy tubers. They have forgotten whatever use the other local orchids may have had in the past.

One doesn't have to go to Alaska or northern Canada to find cold-hardy orchids, for many kinds grow in the United States. The showy orchid (*Orchis rotundifolia*) is a first cousin to the Aleutian Orchid, and it occurs in most of the northern states as far south as Colorado. Other orchids frequent cool sphagnum bogs all the way from Minnesota to New England. The southern states also have a fine variety of the sorts of orchids that root in soil, some of them beautifully showy, others admired only by botanists.

They are all in the orchid family, a plant family that is justly famous among botanists not only because of its gorgeous and commercially valuable tropical flowers but also because it is one of the largest and truly widespread families among the flowering plants.



◀ THIS is the white orchid of Kodiak Island (*Platanthera*), a plant about fourteen inches tall, with snow-white flowers



Photo by Jack F. Dermid

▲ CLIMBING straight up the branchless trunk of a large pine tree might seem an almost impossible task to many people, but it is a simple accomplishment for this four-foot Corn Snake (*Elaphe guttata*). Released on the ground near by, the snake began to climb when it reached the tree. It moved upward among the grooves and irregularities of the bark with surprising speed and sureness. The snake had climbed about ten feet and was still going when the picture was taken. It clung so tightly to the bark that considerable force was necessary to remove it

Tree- Climbing Snakes

Seemingly
impossible feats are performed
by certain snakes

By C. M. BOGERT

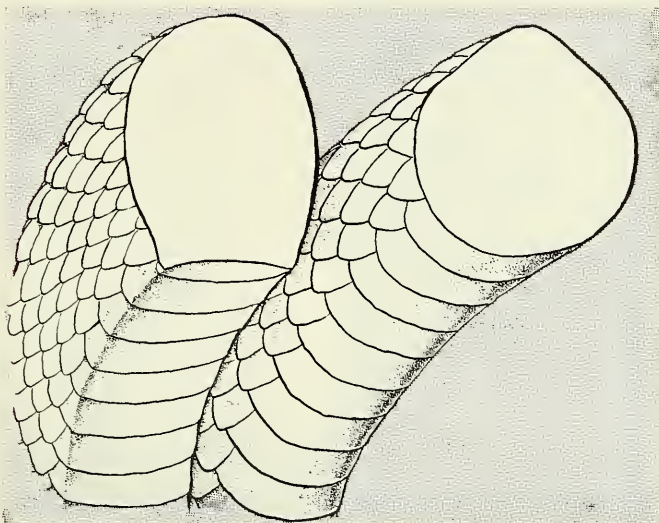
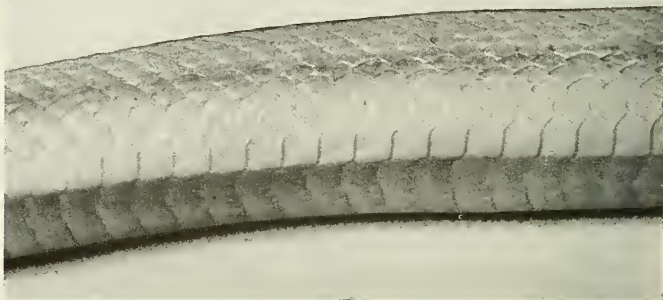
*Curator of Amphibians and Reptiles,
American Museum of Natural History*

THIS excellent photograph by Jack Dermid of Raleigh, N. C. accurately portrays the ability of the corn snake to climb a perpendicular but rough surface. Most, if not all members of the same group (the genus *Elaphe*) climb tree trunks by much the same method, and in this respect they do not differ appreciably from distantly related snakes, including some boas.

It may be worth pointing out that the corn snake and its closer relatives are somewhat specialized. Many American species frequent trees, and one Asiatic species is quite obviously specialized as a tree dweller. However, it should be noted that such snakes are able to climb perpendicular surfaces only when irregularities are present and that not all snakes are endowed with this ability. It involves movements of the individual belly scales, which are controlled by muscles attached to the bony framework inside the body. Careful inspection of these snakes will disclose that the outer ends of each separate belly scale are bent sharply upward at an angle. The

➤ IN CLIMBING ROUGH SURFACES, the Four-lined Rat Snake uses the angular edge of the belly scales, visible in this photograph

✧ SHOWING THE DIFFERENCE between the specialized belly scales of the Four-lined Rat Snake and the rounded Black Snake. The specialized scales of the Rat Snake hold the snake against irregularities while its body is moved forward beneath the skin



middle portion of the belly is flat, but these angular edges of the individual scales are brought to bear on irregularities. They are even thrust outward to avail the snake of lateral crevices in the bark. The belly scales are moved forward in successive waves, while the muscles draw the body forward inside the skin.

Quite in contrast, the belly scales of such snakes as the racers (*Coluber constrictor* and its subspecies) are rather firmly anchored to the internal skeleton. The belly scales cannot be shifted forward in waves. Such snakes do climb trees, but they are incapable of the feats performed by the corn snake and others equipped with a loosely

attached skin. Racers rely solely upon movements of the body and usually gain access to trees by availing themselves of projecting limbs. Occasionally they ascend a tree trunk but only if the bark is extremely rough or if there are branches or twigs near the ground. Under such conditions, they climb rapidly, much more so than a corn snake could. But the corn snake can scale trunks that would baffle a racer.

Many snakes, particularly burrowers or secretive species, virtually never ascend trees. The smaller kinds may turn up beneath the bark of a dead tree a few feet from the ground, and at least one species of blind snake (of the tropical family Typhlopidae) has been discovered in the nests of tree-dwelling termites, probably having followed the tubular tunnel the insects made from the ground.

Most rattlesnakes are poor climbers, and it is only under exceptional circumstances that one leaves the ground. On the other hand, there are some tropical vipers, as well as pit vipers, that habitually live in trees. Such snakes make efficient use of a prehensile tail, which no rattlesnake has.

SCIENCE AND THE INDIAN

Continued from page 275

other in Bolivia. The doctor stayed to run tests, found that 99 per cent of the population was infested with intestinal parasites, with an average of four different parasites per

intestinal tract. No one was surprised. Sanitation is unknown. People walk barefoot over contaminated ground. Children sit half-naked on the dirt floors. To

eliminate intestinal infestation will take the services of school and clinic, plus willingness bred of understanding.

Norman Pava carries on his studies at his house in the hills. We went on horseback up the steep, rocky trail one Sunday morn-

ing to see him. It was a gloriously fresh morning, with the White Cordillera marching above us, radiantly indifferent to what we were up to. We met burros coming down from the mines laden with bags of ore, and we saw a number of houses of an early Andean type—a stone body with a thatched roof pulled up into a topknot.

Halfway up a hill, our horses scrambled up a rocky ledge, squeezed downward between a rock and some trees, and came out on a small plateau by three huts. Norman came out of the far one to greet us, wearing a startlingly white shirt and looking Bostonian behind his dark-rimmed glasses. His open-front adobe house is whitewashed inside and decorated with bunches of brown and yellow corn hanging from the rafters. He offered us water from a large jar in a sling, saying, "It's boiled." A loose-leaf notebook lay open on the table, beside it an uncapped fountain pen and a primus stove. In the dark little sleeping room the jackets of books were bright against the wall—old friends like *Wind in the Willows*, *Madame Bovary*, *The Golden Bough*.

Norman showed us around the tiny plateau. One hut was the family kitchen, with skins that served as a bed at night now thrown over a beam. The third and largest shelter had the big loom, a beautiful black poncho with red stripes lying across it. The only member of the family living here now is an old man, Norman's landlord.

I asked Norman just what he was doing up here, and he said in his modest way, "Oh, I'm making a kind of psychological study." He expected to return to the United States and enroll at Cornell for the spring semester of 1953.

Our horses scrambled off the ledge and down the trail. We then rode across the hills to a Comunidad—an Indian village with civil standing—just outside the hacienda. Here we visited Joan Snyder, daughter of a New York dentist. Dark and slight, she looked stylish

in blue jeans and white shirt. A lovely smell came from the pot on her stove. Joan told us that every evening when she and the friend from a near-by town who lives with her are cooking dinner, they turn on their radio. Silently, dark forms slip in to sit on the bench by the door. In the morning, the girls discover what foods their guests didn't fancy by the scraps on the ground behind the bench.

Joan at 22 has had a good bit of experience outside her own culture. She spent two summers working with the American Friends Service Committee in Mexican villages. Spanish is almost a native tongue to her now, and she is learning Quechua. She is studying the relationship of the Comunidad to the federal government and to other villages. Like all members of the group, she enters into the life into which she has chosen to cast herself, but sometimes during a festivity she is stuck with a mouthful of the fermented *chicha*, which she had planned to spit out. "They hand you the jug," she said, "and you take a mouthful; then someone quickly turns a flashlight on your face and asks you what your name is." Joan returned to the United States at the end of 1952 to enroll at Cornell for the spring semester.

That afternoon we watched the Sunday sights. Just below, a man with a cart was peddling some kind of shaved ice mixture. They get their ice on the hacienda in the grand manner—someone goes up and cuts off a hunk of glacier. A woman such as advertising men put on their travel posters was coming in from the highway. Her bouffant cerise skirt was loomed up after the local fashion to show the lime-colored underskirt. A garland of flowers lay around the high crown of her mannish white hat. She was staggering. No liquor is sold on the hacienda, but the Indians get it in the village; and they make it.

"What we have on our hands," commented Dr. Holmberg, "is essentially the running of a small

nation, together with the job of trying to study its development. Literally hundreds of problems arise for which we haven't enough people."

At first the Indians sat silent and wary at the open meetings every Wednesday. Now they want to stand up and be heard. One of the influential men on the hacienda says that about 50 per cent of them are in favor of what is going on. "Things were never like this before," some of them say.

The other 50 per cent ask, "What do they expect to get out of us?" This attitude does not upset the anthropologists.

I heard a few people in the American colony in Lima speak of the project as though it were a curious bit of humanitarianism by nonmissionaries, but the anthropologists would never let them say this. They insist the experiment is basically a scientific study in which anthropologists with various specialties are focusing their attention on a community in the high Andes that has been isolated from our technological civilization. During the five years of the experiment, graduate students will continue to come to do field work. They will study the shift in native cultural patterns under the impact of modernization.

The difference between their project and classical anthropological studies is that the anthropologists themselves are engineering the changes in culture among the 2250 Indians on the hacienda and studying the reactions to their own handiwork. The difference, therefore, is in a certain creative purpose. Their endeavor is to raise the status of the Indians and prepare them to make a transition confidently that they must make anyhow.

Applied anthropology is something they have only begun to try out. They have hopes but make no claims. Anthropologists, even as you and I, have their superstitious ways, and at this early stage they simply have their fingers crossed.



▼ A LEOPARD descending after he cached his food supply in the tree

▲ A HERD OF ELEPHANTS plunge into the water. One of the many thrilling wildlife scenes from "Below the Sahara"



▲ AFRICAN NATIVES in "Below the Sahara"

► ARMAND DENIS and his wife Michaela as they appear in "Below the Sahara"



"Below the Sahara"

"**B**ELOW the Sahara" (RKO) takes the movie-goer to Africa with its great variety of natural wonders. Dr. Harold E. Anthony, Chairman of the Department of Mammals at the American Museum and an African explorer comments:

"This film is a series of very interesting sequences of African wildlife and native peoples. Insofar as the geographic location of this activity is all in the southern half of Africa, there is some significance to the title; there is nothing in the film that has to do with the Sahara.

"This is splendid photography, with good color values, of unusual episodes. There is no shooting of animals by Armand Denis, all the hunting is with a camera. The camera shots are taken with a good sense of drama and of composition. This means that one views the film with interest held at a high level and at the same time encounters much which has sheer beauty to hold the attention.

"Armand Denis and his wife Michaela are prominent in much of the action, but

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

The Screen

they do not steal the limelight from the animals and they properly belong on stage.

"One of the sequences shows noosing animals from a truck. This apparently does no great damage to the captives and one wonders if the risks to personnel and equipment are not really very considerable when, for instance, the captive is a rhino or a buffalo.

"At the southern tip of Africa the cameraman hangs from a rope to record

the nesting of vultures, and at another site associates with great colonies of penguins and sea lions. An Antarctic touch enters the African scene at this point, but it adds variety and quite a touch of humor.

"A typically African episode is the journey into gorilla territory and the filming of a native drive against a troublesome family of gorillas.

"In this brief report it is not possible to enumerate all of the highly enter-



▲ CAMP scene from "Genghis Khan"

taining and instructive events in the film. There is a concentration within this brief time span of so many things that one could experience only after years of an African background. A few of the episodes are obviously staged, but most of them must be nature in the raw.

"Native dances and costumes are good. The sound effects are convincing and add greatly to the impressions made by the film.

"In brief, this is an African film with an authentic flavor and a minimum of Hollywood transplants."

In commercial films on Africa, the movie-goer expects to see the big-game hunter pitting his strength against the lion, the leopard, or the crocodile. Is this what the public wants? Armand Denis, Director and Producer of "Below the Sahara" puts the question to the public. Will there be more pictures like this one? The box office receipts will answer this.

"Genghis Khan"

"**G**ENGHIS KHAN," a United Artists picture appropriately filmed in black and white, is below reviewed by Walter A. Fairservis. Dr. Fairservis was on military service in Mongolia, the very territory from which the Great Khan originated. He has also made scientific expeditions into Central Asia.

"If you were to ask an Asiatic," writes Dr. Fairservis, "who were the greatest conquerors in history, he would answer, Alexander, Tamerlane, and Genghis Khan. The Filipinos in keeping with this Asiatic tradition of 'earth shakers' deal with the legends surrounding the early life of the third of these war leaders, the Mongol Temujin, or as he is popularly known, Genghis Khan. In a series of broad episodes, we see Temujin's struggle on the Gobi plain with the dominating Karait tribe and its leaders, the miraculous escapes of Temujin, the rise of the

Mongol military power, the courtship of Princess Li-Hai, and finally the victorious Temujin swearing the oath of world conquest, which later he almost fulfilled.

"Technically the faults of the picture are many: the geographic background (It is told in the narration that the territory represents the Gobi plains, but is actually the Philippine Islands) and the material culture are scarcely Mongol. Nevertheless, the Filipino awe of the famous leader, combined with a wonderful enthusiasm for the story, has brought out a kind of contagious spirit, which may well be akin to that of Temujin and his contemporaries. The Tagalog language (English narrator), the enthusiastic broad acting, the zest expressed in the scenes of feasting, quarreling, intriguing, and fighting, and the excellent music effects have a strong appeal. The story is told without subtlety or refinement, which is perhaps more nearly valid for the Mongols than the pale imitations Hollywood often uses for people of this ilk."

Brief comments on films previously reviewed

Documentary and Grade A

The Alaskan Eskimo

The first in a series of films on people by Disney

Bear Country

A Disney True-Life Adventure

Down the Alphabet

Beana Devil

3-D film based on Colonel Patterson's classic book about building an African railroad

Seminole

Somewhat distorted story of Second Seminole War with ideological overtones

What the Experts Said

Straight reporting on a single Eskimo community, where something of the old way of life survives

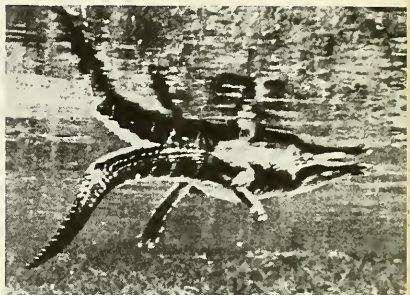
Interest, drama, and continuity with a sound overall plan

Silly plot that does not follow book. Visual discomfort from glasses

Unpretentious, but new type of Indian picture in which the action interprets a constructive idea



▲ OTTERS AND ALLIGATORS play leading roles in Disney's "Prowlers of the Everglades"



"Prowlers of the Everglades"

"**P**ROWLERS of the Everglades," another film in Disney's True-Life Adventure Series is currently being shown with "The Sword and the Rose."

"This very entertaining and instructive film captures a surprising series of wild-life adventures in an environment that affords a splendid background for stealth, surprise and sudden death," writes Dr. Harold E. Anthony. "The Everglades is a region of lush aquatic flora and of abundant animal life. Here is a continuous cycle of prey upon lesser creatures and escape from greater. The animal that is without question Public Enemy No. 1 in the Everglades is the alligator.

"A whole series of sequences in beau-



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tiful color show what is actually taking place under normal circumstances. Some of the most dramatic episodes record what happens under exceptional circumstances in an environment of clear water and clean sandy bottom.

"The herons and other water birds seize the fish or frogs of the upper waters, the alligator stalks the birds or grasps the turtles or larger fish of the deeper waters, and in and out of the action move the skunks, raccoons, and otters as an opportunity occurs. The domestic life of the alligator is highlighted. The baby alligators come out of the egg with an urge to bite, which never leaves them.

"This is fine natural history, which loses none of its drama by being factual. Existence in the Everglades is precarious; nature is ruthless; but there can be little doubt that these events are pictured as they actually occur."

Richard Pough, Curator of the American Museum's Department of Conservation and Use of Natural Resources also comments:

"Prowlers of the Everglades' is a superb film. Never have the graceful egret and other herons and such other colorful birds as the purple gallinule been better portrayed. Many of the settings have the ethereal beauty of a Chinese landscape painting. The scenes showing the feeding methods of such birds as the roseate spoonbill are truly spectacular. It is certainly deserving of the oft-used Hollywood phrase 'action packed.'

"The film's only serious fault is an occasional anthropomorphism—the ascribing of human attitudes and motivations to animals and the occasional use of such terms as 'treacherous' that imply the existence of a moral code for animals."

"The Great Sioux Uprising"

THIS "western" has everything, including a beautiful but honest lady horse trader. The photography is good and it adds up to 80 minutes of entertainment—if you are 12 years old, or just like "westerns" anyway.

The noble Sioux are dragged in only incidentally to supply background for the machinations of the villain, and well-intentioned but mistaken menace for the principal characters. These are Hollywood Indians and are always seen dressed in their best, but at least they are represented as humans with normal reactions.

There is little point in being too critical of a picture of this class. I missed the cur dogs that were ever present in Plains Indian camps, but enjoyed this horse opera anyway.

JAMES A. FORD
Assistant Curator of
North American Anthropology
A. M. N. H.

way, the dancer emitted a spurring, hissing noise, which sounded like steam. When we studied the film in New York, we saw that the female had entered the immediate dance arena some 20 seconds before the peculiar hissing burst forth into a very loud, rasping, explosive note. She seemed drawn to the side of the dancing male as iron filings are to a magnet. Approaching from a point slightly above the male, she slowly moved directly toward his head, her beak opening spasmodically, her wings half folded and flexing nervously.

At the moment of highest excitement, when the male's gorgeous crown plumes undulated so close to her as to almost touch her head, the male and probably also the female leaped suddenly upward some 18 to 24 inches. Quite appropriately, the climactic explosive call "*Kis-sa-ba*" marked this peak of emotion. After the spasmodic leap, I saw two birds as they flew directly overhead. Side by side against the sky, one of the pair was clearly seen to have two long blue streamers trailing behind. The other, a bird of similar size, was in the ordinary gray dress of the female and young male. The crown quills of the male hung back over the tail, apparently touching it but not touching each other. They appeared quite straight and stiff.

I do not know whether the birds completed the mating at about this point in the courtship performance.

In fact, I did not see them again. Earlier I had found that this male had three dance limbs some 500 to 2000 yards apart. These were all in the upper third of rolling mountain forest, usually near gorges but well back from streams and rivers. The lowest was about 50 feet up, the highest about 100. Whenever I flushed this male from one perch, he made a beeline to another of the three, but until now he had always been alone.

This time, however, it seemed fairly obvious that the rakish male had used his gaudy ornamental plumes and resounding notes to good avail and that the next phase in his innate behavior would be the coronation of another Queen of Saxony.

After the brief affair, the Queen would leave this male and carry on without assistance or recognition of any sort. As with some cotingas, manakins, grouse, bowerbirds and lyrebirds, all of the ornamented Birds of Paradise are polygamous. This remarkable family, consisting of 42 species, is restricted to New Guinea and its satellite islands, with the exception of two species that reach northern Australia and two that occur in the Molucca Islands. The 20 spectacularly plumed birds of the family occur only in New Guinea and mainly in the most inaccessible mountains of the interior.

In birds of this kind, the males select a courtship territory. In the

Greater Bird of Paradise, a single male reigns over a limb, usually high in open forest, where a drone of females, young males, and a few curious or jealous males in full regalia collect to play and posture in the morning and late afternoon throughout the year. In other species, such as the Magnificent Bird of Paradise, the male dances on a vertical tree no higher than a broom in deep forest. It clips leaves overhead to permit shafts of sunlight to penetrate the gloom, and it cleans the ground with all the fussiness of a disciplined housewife.

Both the Blue Bird of Paradise and the Emperor of Germany Bird of Paradise hang upside down, spasmodically causing their gorgeous lace plumes to shiver.

The purpose of these displays is, of course, to lure as many females as possible into the nuptial chamber. The female after her brief affair, leaves the male for good.

The difference in dress, size, and song between the sexes in these species is usually very great, so great that if the resplendent male were to engage in the activities of nest construction and incubation or in the care and feeding of the young, he would doubtless reveal the location to the creatures that would like to make a meal of his progeny. Thus, in the system of things, the King of Saxony, like all of the ornamented Birds of Paradise, plays no part whatever in domestic chores. His paradisean way of life is like that of a bejeweled sultan of old.

LETTERS Continued from page 241

hundreds to the ground and destruction.

In middle June, from early morning to evening, the continuous hum like a distant factory whistle or a gigantic swarm of bees will be heard from every forested area, for this will be where most of the adults will be found. More open country, orchards, farm yards, and cities will not experience these great multitudes, but stragglers will be everywhere, and then one will be able to hear the sound made by the individual insect. This starts as a low hum, rising to a crescendo, to fade away again lasting usually slightly less than a minute. Only the males "sing" a noise, produced by two vibra-

ing plates on the underside, at the base of the abdomen. The female stands near by, for this noise is believed to be a mating call. Since she has no sense organs, as in the grasshoppers, katydids, and some other insects, she probably receives the vibrations through her body walls.

Now begins the busy season for the female, for she has to provide for the next generation. One hundred to two hundred eggs will have to be carefully inserted in holes drilled by her ovipositor in green twigs of suitable trees. They are placed in two parallel rows of about ten or twelve to a row. This severe operation usually results in the twig dying, which we will then see as dry brown

leaves cluttering the trees in the fall. Nurseries and young orchards may suffer from the damage. However, much of the damage caused by the cicadas is never visible to our eyes, for the real damage is the continuous loss of sap to which the trees are subjected—by the sucking nymphs. When the eggs hatch in the fall the little nymphs drop to the ground and immediately start to burrow into the ground.

The cicadas lead a precarious life, for if the elements do not destroy them in the adult stage, the nymphs may die from fungus attacks while underground. With the constant changes in the countryside, the trees may be cut down in a large area thus starving the little nymphs

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feeding on the roots. Thousands of adults are killed by wasps or carnivorous insects, and by the numerous mammals, both large and small that feed upon them. Probably the greatest number fall prey to hungry birds. The English Sparrow redeems itself in this way, for it delights in dashing at a drumming male, seizing it, tearing off its wings, and devouring the juicy body.

With their life cycle of seventeen-years (thirteen years in the southern States) completed in early July, the Seventeen-year Cicadas will vanish almost as quickly as they appeared until the next brood is due to arrive.

JOHN C. PALLISTER,
Research Associate,

Insects and Spiders, A.M.N.H.

Talons not Bill

SIRS:

In the last number of NATURAL HISTORY in the article on Heermann's Gulls the author tells of an osprey holding a fish "crosswise in the bird's bill" (p. 184). As I understand it the osprey's bill is too small to hold any fish larger than a small minnow.

In Audubon's picture the osprey is shown carrying a large fish in his talons. I was not aware the osprey carried a fish in any other manner.

LOUIS CASAMAJOR

New York, N. Y.

Dr. Casamajor is quite correct. The Osprey lifts and carries fish only in its talons. It is the gull that carries a fish crosswise in the bill.

JOHN T. ZIMMER
Curator of Birds
A.M.N.H.

SIRS:

I have always been more than doubly rewarded by the fine and timely articles in NATURAL HISTORY, but today I really had a surprise!

Last night I read Max Miller's book "The Cruise of the Cow," (1951) a true story of a voyage he and four fellow naturalists made into the Gulf of California. The folksy manner in which it is written was just fine—that is until I came across a wonderful photograph on page 113 with the following caption: "Lew knew what kind of a sea gull this is, but I forget. Anyhow this is his or her nest." I didn't think that was quite cricket, leaving his readers to do the research. You can well imagine my delight when the very next day I read the April issue of NATURAL HISTORY that contained Lewis Wayne Walker's article, "Heermann's Gulls at Home." This of course was the "Lew" referred to, the photographer-ornithologist and originator of the voyage!

... I promptly added the following to the caption: "Heermann's Gull."

LILLIAN STARK

Newark, N. J.

FROM READERS:

I hope you continue with your candid comments on films. . . . I like the beautiful magazine covers and the explanations of them on the title page . . .

from a teacher

I lived in New York City for 35 years. I have now moved to the country and built a home. I bought top soil, planted trees and shrubs, and have bird feeding stations and twelve bird houses. These have attracted ducks, red wings, thrushes, and hawks, etc. All of this new life was inspired by NATURAL HISTORY.

I now give subscriptions to NATURAL HISTORY to my friends' sons and have young ornithologists and ichthyologists all over the place on a common meeting ground.

from an art consultant

I am always keenly interested in the Magazine, which remains a link with the Museum. I think that the new movie comments are a welcome addition.

(Mrs.) Andree Desbriere Irwin

One-Man Expedition to Brazilian Jungles

As this issue of NATURAL HISTORY goes to press, its editor, Dr. Edward M. Weyer, Jr., is setting out from Rio de Janeiro, Brazil, for the interior of South America on a one-man expedition. His purpose is to study the Indians of the tributaries of the upper Xingu River, a large stream that flows northward through the heart of Brazil to the Amazon. Word recently received from Dr. Weyer informs us that his equipment includes a hammock, a paddle, a bow, a machete, dehydrated provisions, and trade goods with which to procure an ethnographic collection for the American Museum.

To Africa

An eight-month expedition to Africa under the leadership of Colonel William J. Morden for the purpose of collecting mammals, birds, and anthropological specimens for the American Museum of Natural History left May 5.

In addition to collecting, Colonel Morden's party plans to make a documentary film showing a typical day in the life of a Southwest African tribe.

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Summer Naturalist

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by ERNEST MAYR

Science Guide No. 127, 60¢ postpaid

An authentic account of the historical background and many little-known facts concerning the doily life of these magnificent birds—gained from two expeditions to the forests and mountains of New Guinea.

The Life History of the Monarch Butterfly

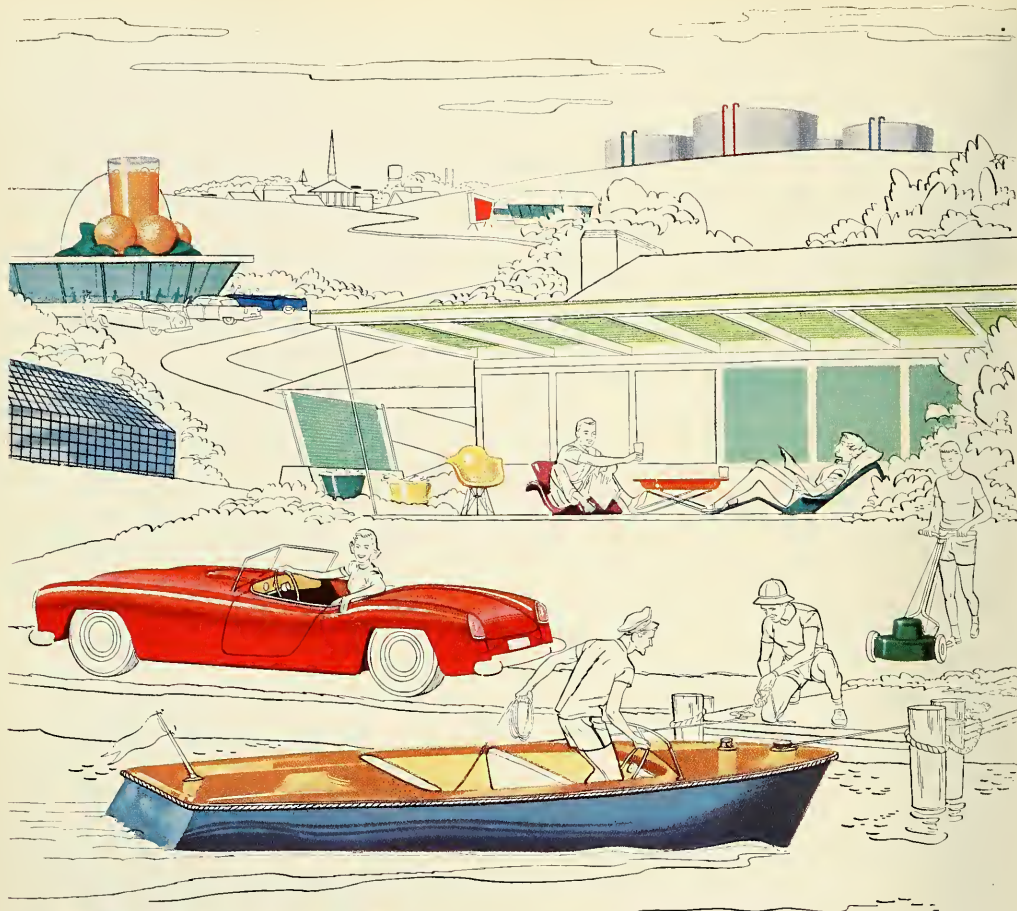
by LUCY W. CLAUSEN

Science Guide No. 132, 37¢ postpaid

The complex life history of the higher insects is as unique as it is intriguing, and its study is a constant source of interest and amazement to the uninitiated. The monarch butterfly affords an excellent example of this complex metamorphosis.

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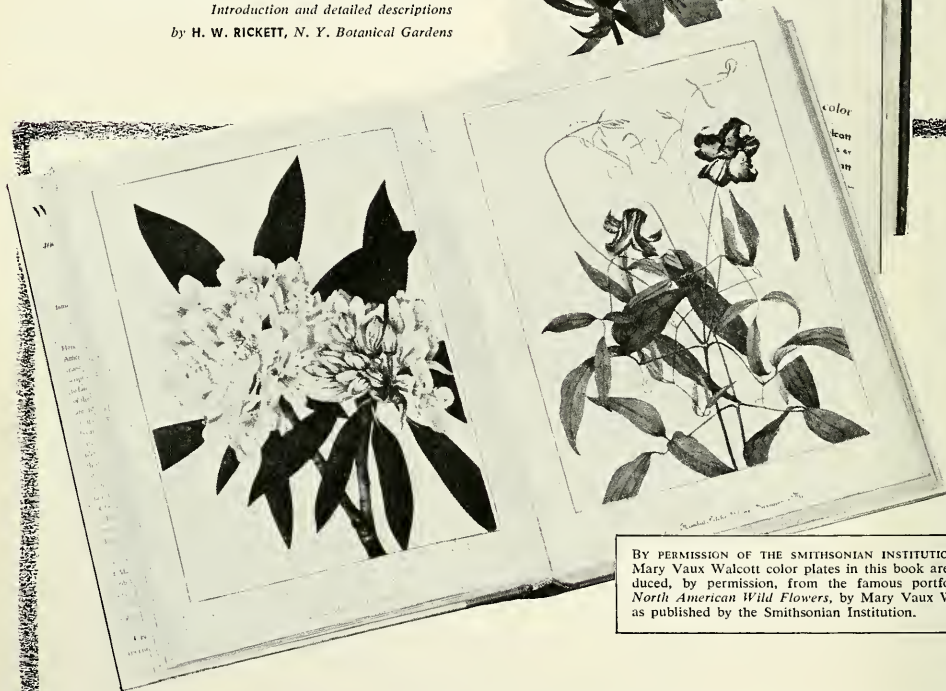
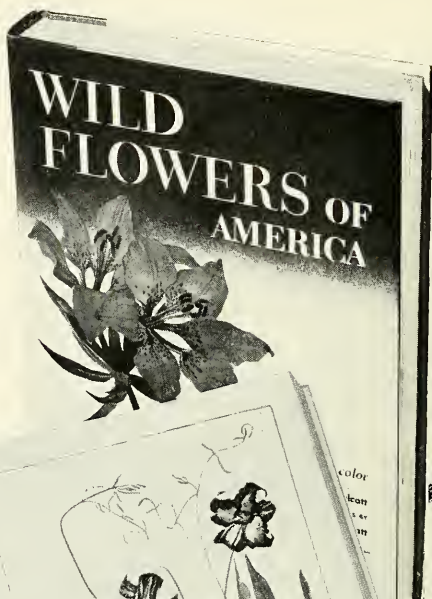
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LETTERS

Expectant Father

Sirs:

Mr. Lynwood Chace's fine photograph of the giant Fish Killer in your May issue of *NATURAL HISTORY* Magazine brings to mind a photograph I once took of a similar specimen. I am told that it is the male that carries the eggs around on his back until they hatch. The photograph also shows the pale, nearly transparent, newly emerged young (near top) as well as an older brother (or sister) of an hour or so (lower right).

I consider your magazine one of the finest publications dealing with nature, and its many excellent photographs are a constant source of pleasure and inspiration.

Tracy, Calif.

ELLSWORTH HAGEN

Mr. John C. Pallister, of the American Museum's Department of Insects and Spiders, offers the following information:

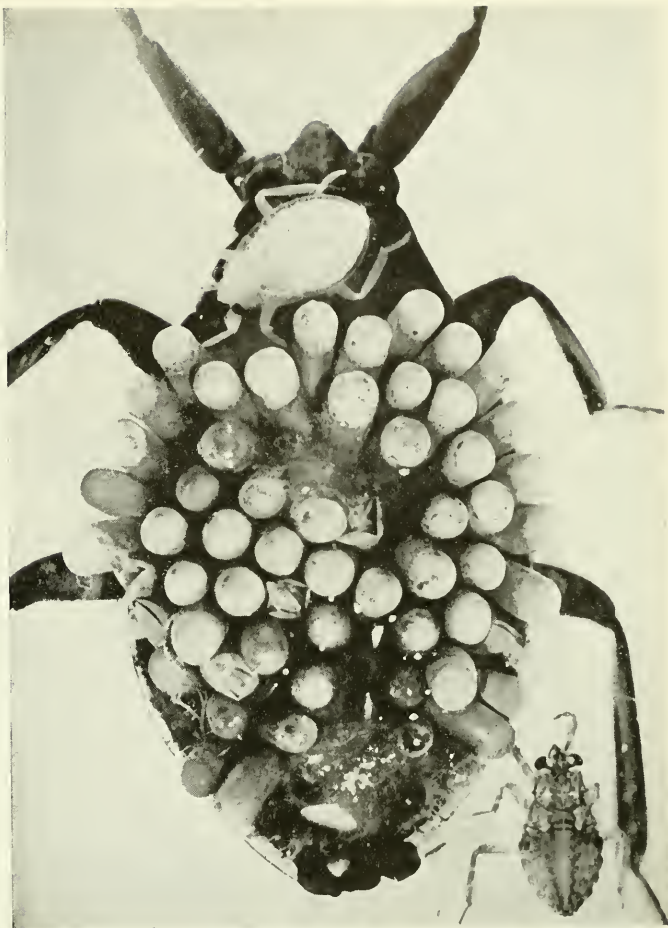
The photograph shows one of the true bugs of the family Belostomatidae. They are popularly known as Giant Water Bugs, Fish Killers, Toe Biters, Electric Light Bugs. Each of these names refers to one of the activities of this interesting family of insects. These bugs are strong swimmers and night fliers. They are veritable demons in fresh water, where they prey upon fish, frogs, toads, tadpoles, salamanders, snails, and water insects. The middle and hind pairs of legs are used for swimming, the front pair are ready to seize their victims. With a supply of air carried under their wings they are the submarines of the insect world.

Mr. Hagen is correct in saying that the male carries the eggs on his back until they are hatched. In at least three genera, it is known that the female glues her eggs on the back of the male. In the photograph the eggs are beginning to hatch. The little ones will remain nearly transparent until they have started to feed and have moulted for the first time. As the eggs hatch, the load on the male's back decreases, but he is never entirely free, for the bases of the egg shells frequently remain for the rest of his life, so firmly are they attached.

The family is not a large one, for only a little over 150 species have been described from various parts of the world.

Sirs:

It is not my custom to compliment any magazine, but I think yours is worthy of a letter of praise, and it is for this reason that I am writing you. I have been a subscriber to *NATURAL HISTORY* for about two years, and although I do not approve of everything in it, I cannot help but admire and enjoy a publication which,



by word and picture, is able to arouse so much interest in nature.

I hope you will stick to the high standards you doubtless set for this magazine. You will thus ensure my support of a cause I believe very commendable. Thank you.

ADRIEN PIGEON

Shawinigan Falls
Quebec, Canada

Do Not Miss

A Journey to the Jungle Tribes of Central South America with your Editor—an exploration story to be carried exclusively in NATURAL HISTORY Magazine beginning next month.

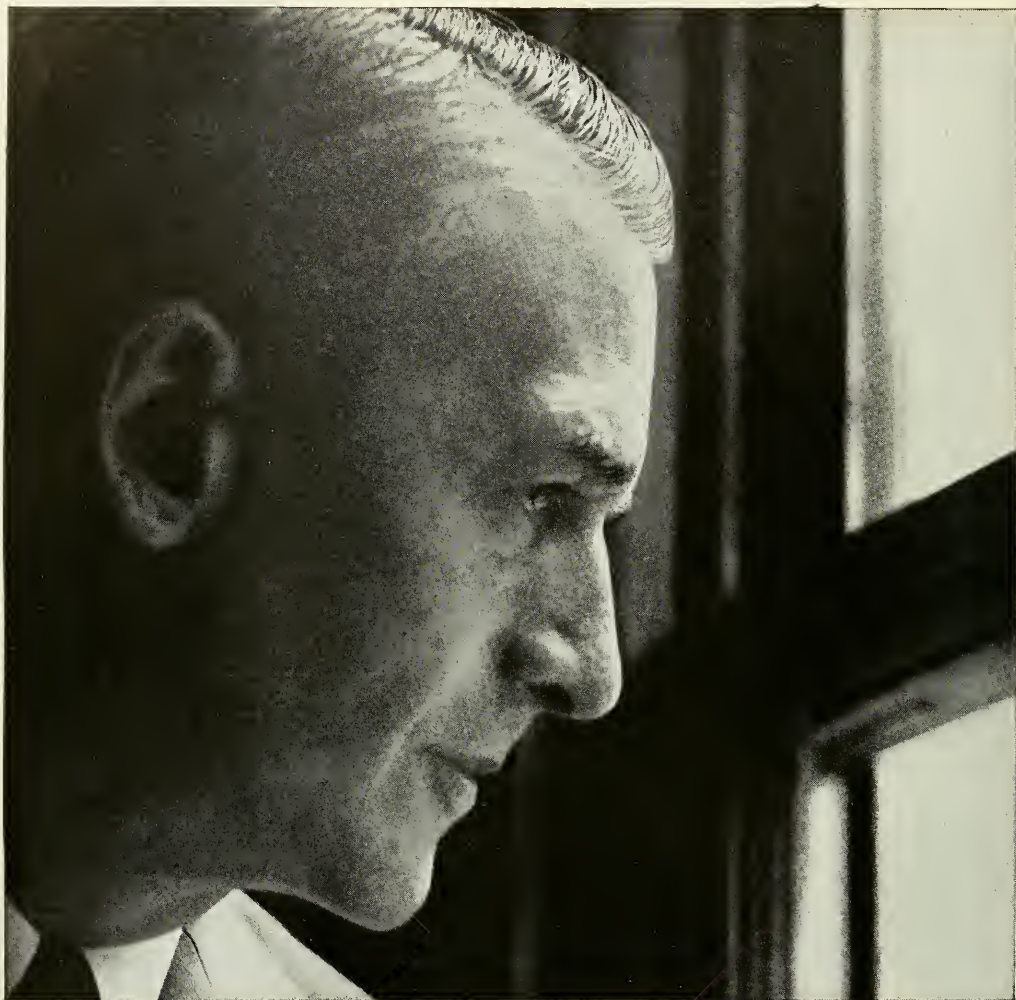
Navajo Blankets

Sirs:

Having lived several years in the Navajo country, I would like to point out that the blanket the women are sitting on in the cover picture of the May *NATURAL HISTORY* is not a Navajo blanket as implied. The Navajos do not use this sort of design in any of their blankets. They seldom use or wear blankets of their own make but dispose of them to the traders for manufactured blankets of various gaudy colors and designs. They can procure the latter at prices much lower than they get for their own genuine Navajo blankets.

Many a tourist has priced Navajo blankets at stores of licensed Indian traders and then gone out on the Reservation and bought a manufactured blanket from the back of a Navajo at a much lower price. When the tourist gets back home and examines his highly prized blanket, he may be surprised to find in one corner, "Made in Pendleton, Oregon."

Continued on page 334



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MOST OF THE TIME marble and steel disguise it. But after a visit or two to *any* bank you begin to see its true profile.

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You will find NATURAL HISTORY Magazine indexed in Readers' Guide to Periodical Literature in your library



THE COVER THIS MONTH

The hippopotamus is one of the largest living land animals, and its yawn can hardly be equalled for cavernous immensity.

The hippo subsists on aquatic plants and other vegetable matter, which it somehow manages to chew sufficiently despite such extreme mal-occlusion as is exhibited in this photograph. Both the canines and incisors continue to grow and are occasionally used as a source of ivory. The animal sometimes causes great damage to crops.

With eyes and nostrils that protrude above the water when the rest of the animal is submerged, the hippo is well adapted to life in its African rivers. Ordinarily, it is mild tempered, but an animal that has been wounded or is defending its young can show great ferocity. The natives hunt hippos for their meat and fat, and they use the thick, tough hide for shields. In recent decades the range of the hippopotamus has become much less extensive than it originally was. In fact, in prehistoric times, hippopotamuses lived over much of Europe.

This striking portrait was taken by George B. Morgan.

Publication Office: American Museum of Natural History, Seventy-ninth St. at Central Park West, New York 24, N. Y.

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THOR HEYERDAHL'S
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of his theory about
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AMERICAN INDIANS IN THE PACIFIC

**THE THEORY BEHIND THE
KON-TIKI EXPEDITION**

By THOR HEYERDAHL

THIS ground-breaking book challenges one of the anthropologists' favorite assumptions—that the natives of Polynesia sprang directly from Asiatic stock. It is Thor Heyerdahl's ambition to prove that the Polynesian Islands were first peopled by pre-Inca dwellers from South America rather than from Asia. So intent was he on demonstrating his point that he embarked on the raft *KON-TIKI* to show the world that the trip from South America to Polynesia *could have been made* by a people barely out of the Stone Age.

IN his new book he presents a careful, step-by-step buildup of facts which point to the American origins of the Polynesians: American cultivated plants transplanted to aboriginal Polynesia; similarities and identities between American Indian and Polynesian physiques, blood groups, customs, folklore, dress, implements, words, canoes, and rafts. Woven into the book's main theme are fascinating bits of information on such subjects as mummification, picture writing, trepanning, sun worship, musical instruments, cannibalism, and the decay of ancient civilizations.

SINCE this book was written, Thor Heyerdahl has discovered evidence on the Galapagos Islands showing that a pre-Inca people once stopped there. His latest experiments with balsa rafts have proved that ancient Indians could navigate against the wind by lifting and lowering their centerboards in correlation with wind and sail. He draws on many branches of science in this brilliant study of a people who have long defied the scientists' attempts to classify them as Asiatics.

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Eugenie Clark: Lady With a Spear
Climbing Mt. Kenya • Conservation

LADY WITH A SPEAR

----- by Eugenie Clark

Harper and Bros., \$3.50
243 pp., 36 illus.

AS the professor said, "A preposition is a bad word to end a sentence with." Nevertheless, Eugenie Clark is a very youthful person for so much to have happened to. This book tells all—well, nearly all—in an outpouring that never slackens and never fails to entertain.

It is the story of an extremely piscatorial life, from childhood to young matronhood, which began in the old New York Aquarium and proceeded by way of California, the West Indies, Hawaii, the Palau, the Red Sea, and home again. The author knows fishermen as well as fish. It may be hard to milk money from the rich, she writes, "but ask a strange fisherman to help you find a specific fish (the harder and rarer the better) and you will immediately get his interest and eventually his wholehearted help. You don't have to know his language; just draw a picture . . . gesticulate . . . and let him lead the way."

Dr. Clark has found herself in all sorts of parlous situations but has always come through unscathed. An old South Sea Island chief, endowed with proper paternal solicitude, once supplied her with a chaperone because her living quarters had to be in the *abai* or men's club of the native fishermen. The fact that the "chaperone" was, of course, a man mattered neither one way nor the other!

Eugenie recounts the most extraordinary tales with a pithy directness that somehow does not conceal her human sympathy. One of her most indispensable cronies in the South Pacific, for example, was Niraibui, her boatman. He, unfortunately, spied some metal drums marked "alcohol" on a Navy truck. "That was the one word he could read in English. The fact that the complete label read *methyl alcohol* didn't concern him. He punctured a hole in one of the drums and drank to his heart's content and end."

The author's fundamental diplomacy has evidently enabled her to fulfill her purpose wherever she found herself, whether the process of communication involved English, Japanese, French, Micronesian, Arabic, or sign language.

She has the knack of getting into cahoots with men, women, and children, and she tells her experiences in extremely sprightly fashion. Nor is the serious purpose of her investigations neglected, for, with equal clarity, she discusses sex-isolating mechanisms, experiments on the courtship and breeding of various fishes, and the nature and periodicity of the toxic effects that the flesh of certain species have upon human beings in various parts of the world. Particularly vivid is her passing note relating to the vast biogeographical gap between the Mediterranean and the adjacent Red Sea. The former has purely North Atlantic affinities, whereas the life of the Red Sea is Indo-Pacific and closely allied with that of far-distant Hawaii.

R. C. MURPHY

NORTH FROM MALAYA

----- by William O. Douglas

Doubleday and Co.,
\$3.95, 352 pp.

THIS latest book of the roving Justice tells of explorations among peoples rather than experiences among mountains and physical environments. He writes of the struggles of opposing national policies, of the turmoil seething in southeast Asia.

The book deals concisely with Malayan jungle guerrillas, the Huks of the Philippines, Vietnam—a nation in disintegration, Burma and the counterrevolution, Formosa, Korea, and the fifth front. Here the communists are in opposition to the government in power; they are trading on the resentment of the populace for exploitation by landlords, money lenders, and the privileged few. These abuses may have been going on for centuries; they may have been by outlanders or by their own race. From our point of view exploitation has been indefensible and a future under such conditions would be bleak and hopeless.

Justice Douglas traveled under favorable auspices, met influential persons, and used planes to cover a wide area in a short time. Often he must have exposed himself to considerable hazard. He attempted to look into both sides of each issue at stake, and his analysis of a situation is the well-balanced summary one would expect from a person with his

background. There can be no question as to the seriousness of this situation as it affects southeast Asia and politics throughout the world.

One may wonder, however, whether such a brief visit could possibly equip anyone with the full insight and understanding to equate all of the obvious, allow for the intangibles, and come up with a practical answer. Some of the author's conclusions may arouse controversy.

Doubt will arise in the mind of the reader concerning a realistic solution for the tragic problems described. Perhaps one idea will emerge with respect to the difficulty of taking over national burdens throughout the world. The United States can not be all things to all men.

HAROLD E. ANTHONY

WIND, STORM, AND RAIN

by Denning Miller

Coward-McCann, \$3.95
177 pp., 10 figs., 8 photos

IN these days of increasing departmentalization in scientific endeavors, it is refreshing and heartening to come across an author who presents the larger view of one of the most important branches of science.

Mr. Denning Miller, in "Wind, Storm, and Rain," focuses his attention on the weather forest rather than the trees. By no means has he compiled a text-book treatment, nor does he oversimplify the complex patterns of the weather story. Combining an engaging writing technique, an authentic array of factual material, and an excellent continuity form, Mr. Miller has captured the sweeping panorama of the air ocean under whose broad currents, mobile depths, and volatile expanse we live and die.

Starting logically with a dissertation on the nature of the atmosphere, Mr. Miller proceeds to unfold the dramatic story of how our daytime star, the sun, sets the mighty air currents into motion. A global picture gradually emerges, in which huge parcels of air, moving in rhythmic patterns, sweep over vast surface portions of the earth, colliding in fury and waging a never-ending battle for domination. The change of aerial moods, a description of the cloud families, an analysis of the upper tenuous air heights, and a linking of weather to historical phases lead gradually to an outline of how a general knowledge of meteorology may be applied to everyday living.

This is a book for adults who wish to understand more about the cosmos in which we live. It might also be termed a series of illuminating essays. It is particularly pleasing and helpful because we are part of an air age and because we stand on the threshold of man's greatest physical adventure—an escape from our

enveloping air ocean to the outer reaches of space.

FRANK H. FORRESTER

THE OVERLOADED ARK

by Gerald M. Durrell

Viking Press, \$3.75 272 pp.

IN this fascinating book, for which a better title might have been found, Gerald Durrell tells how he and a friend made a trip to British Cameroons to collect living wild creatures for various zoos. Besides the pleasant, easy style of the writing, the admirable restraint and absolute fidelity to the truth are the two elements in this story that are most impressive. Having had the experience of collecting mammals for a long period in the contiguous French Cameroons, where the environments are virtually identical to those described by Durrell, this reviewer is in a position to draw very exact comparisons. The author reports his conversations with his native helpers in pidgin English, and very accurate West Coast pidgin it is.

One of the most interesting and amusing chapters is the account of the big chimpanzee, Chumley. The stone throwing episode is not surprising, as the present writer had stones thrown at him very accurately in the same underarm manner by two captive chimps at Kribi.

Some of the interpretations offered by Mr. Durrell, such as the ones mentioned below, will be received with raised eyebrows by animal behaviorists. Birds that perched at night on slender twigs near the ground "knew" that should anything try to crawl along the stick after them, its weight would shake the branch—and give them warning. "I watched [the toad] hop off into the undergrowth with . . . an astonished look on his face." . . . in the chimpanzee world, to place your finger between another ape's teeth is a greeting and a sign of trust . . . Chumley was flattering me by treating me as he would another chimp."

The pen drawings by Sabine Baur are accurate and full of life. They indicate an intimate knowledge of the anatomy and postures of the animals pictured.

This attractive story would have been benefited by the addition of a short index.

G. H. H. TATE

NO PICNIC ON MOUNT KENYA

by Felice Benuzzi

E. P. Dutton,
\$3.75, 239 pp.

THIS is a story of mountain climbing under very exceptional circumstances. The author is an Italian prisoner of war in a British camp at Nanyuki, and he



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became obsessed with the idea of escaping from the compound, climbing Mount Kenya, and then returning to the camp to resume his prisoner status. He had had mountaineering experience in the Alps.

The very readable text tells of the monotony of prison life, the devices to escape brooding over fate, and the search for companions competent to climb the mountain and willing to risk the attempt. Weeks are spent in the gradual accumulation of equipment and supplies, which had to be secured and hidden against suspicion of escape. The mountain was visible from some of the territory accessible to the prisoners, and recon-

naissance of a sort provided a vague basis for a plan of operation.

The escape was a success, and the party of three began upon a task of heroic proportions. They were loaded with their ruck sacks, for they could have no native porters. Their food was inadequate, their equipment was makeshift and improvised. Furthermore, they were not in good physical shape for an undertaking that normally would follow a program of preparation and conditioning. The wonder of it all is that these men could endure the hardships they encountered — dense jungle, snow, ice, and torrential rains on what was literally a starvation diet.

The account moves day by day, and the simple style of the author can be very graphic at times. A strong flavor of emotionalism underlies the telling, but it does not get out of hand and it apparently is a bond of fellowship that holds the party together when the going is tough.

The book is recommended as a first-rate piece of writing about men as prisoners and prisoners as mountain climbers.

HAROLD E. ANTHONY

FRESH-WATER INVERTEBRATES OF THE UNITED STATES

----- by Robert W. Pennak

Ronald Press, \$14.00

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streams, or of their own private pond, but not for idle reading.

A. E. PARR

BIRDS AND MAMMALS OF THE SIERRA NEVADA

----- by Lovell Sumner and Joseph S. Dixon

Univ. of California Press,
\$7.50, 484 pp., 37 illus.

THE rather complicated history of the preparation of this compendious work is set forth in the preface. There were many contributors besides Sumner and Dixon. Dixon completed early drafts, based chiefly upon the faunas of Sequoia and Kings Canyon National Parks, but his long illness, culminating in his death in 1952, induced the National Park Service to assign Sumner to combine, revise, and broaden the manuscripts. The authorship is, therefore, successive rather than joint.

The work is naturally slanted primarily to the faunas of the Parks, which contain large portions of original California environments now mostly destroyed outside their boundaries. The book opens with articles on wildlife policies, human usage of the Parks, and life zones. Then follow the two main sections: on birds, and on mammals. Under each species there is a section on "Park status and records." The majority of the species receive about one page of space, but exceptionally complete and well-documented articles are found in the case of the condor, golden eagle, sooty grouse, pileated woodpecker, dipper, fisher, wolverine, black bear, coyote, mountain lion, California gray squirrel, porcupine, mule deer, and mountain sheep.

Illustrations are chiefly good half tones of environments and various species, supported by eight excellent color plates. There are two maps, a good bibliography, and an index.

G. H. H. TATE

THE ROAD TO ABUNDANCE

by Jacob Rosin and Max Eastman

McGraw-Hill Book Company,
\$3.75, 166 pp.

THIS is one of those books that attempts to look into the future. However, it is not based, as are so many, on imagination. The authors' method is to project into the future present trends in our growing mastery of our environment.

The utterly untenable food and raw material outlook for mankind, if we continue to rely on our present sources, is made clear. A brief history to date of man's efforts to better his life by a fuller use of the earth's resources, follows.

Continued on page 333

Where Will You Go in Florida?

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Florida needn't be expensive—not if you know just where to go for whatever you seek in Florida. And if there's any man who can give you the facts you want it's Norman Ford, founder of the world-famous Globe Trotters Club. (Yes, Florida is his home whenever he isn't traveling!)

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Of course, there's much more to this big book.

If You Want a Job or a Home in Florida

Norman Ford tells you just where to head. His talks with hundreds of personnel managers, business men, real estate operators, state officials, etc., let him pinpoint the towns you want to know about if you're going to Florida for a home, a job with a future, or a business of your own. If you've ever wanted to run a tourist court or own an orange grove, he tells you today's insidery of these popular investments.

If You Want to Retire On a Small Income

Norman Ford tells you exactly where you can retire now on the money you've got, whether it's a little or a lot. (If you need a part-time or seasonal job to help out your income, he tells you where to pick up extra income.) Because Norman Ford always tells you where life in Florida is pleasantest on a small income, he can help you to take life easy now.

Yes, no matter what you seek in Florida—whether you want to retire, vacation, get a job, buy a home, or start a business, *Norman Ford's Florida* gives you the facts you need to find exactly what you want. Yet this big book with plenty of maps and well over 100,000 words sells for only \$2—only a fraction of the money you'd spend needlessly if you went to Florida blind.

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▲ CHRISTINE would not relax her hold on the blanket for days



▲ SHE had a very thorough examination and was given a clean bill of health



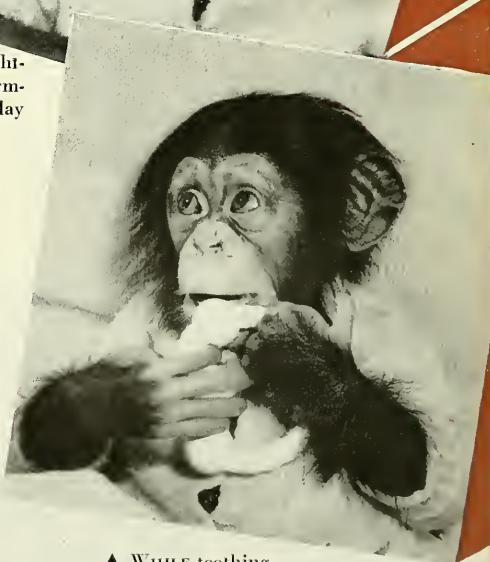
▲ SHE drank an eight-ounce bottle of formula three times a day

Christine

The chimpanzee who found a home
and turned it into a circus

By LILLO HESS

All photographs by the author from THREE LIONS



▲ WHILE teething, she liked to chew on her toys

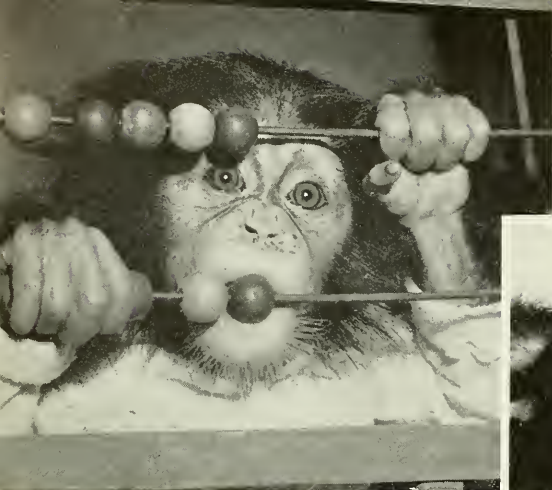
ON April 30, 1952, I visited Henry Trefflich's pet store on Fulton Street just to browse around. As customary when I visit there, I went to the third floor where the apes are kept. I just like to look at them, though seeing them in their small cages always makes me a bit sad. Most of the chimpanzees there are small ones, usually between two

and three years of age, but on this day there was a tiny chimp baby lying on a bed of straw. Her little hands waved in front of her face, as she watched everything about her.

I had seen and liked lots of baby chimpanzees, but none had captivated me so completely as this tiny thing. Her face was very light, with

freckles around her nose and a large brown marking on each side of her eyes. It was her eyes that drew me to her. They were large and soft and a little sad. No matter how young a chimp infant is, it would always look old were it not for its big innocent eyes.

I tried to touch the baby, but she drew away. I talked to her a while,



▲ THE COLORED beads on the side of her play pen fascinated her



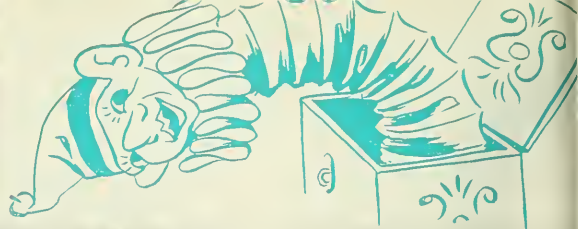
► CHRISTINE'S favorite toy at this time was a little brown Teddy bear



◀ SHE played with her toys much as any baby her age would



► SHE still held on to her toys after she went to sleep



and when she sat up I tickled her. This made her laugh so hard that she got the hiccups. I inquired about her, and was told that her name was Christine and that she had come to the store two months earlier. She was looked after by Miss Taylor, a kind, motherly woman, who told me, "Thank goodness, she is off night feeding now." Dealers don't usually like to handle apes as small as this, for they require the same care as a human baby.

Perhaps you can imagine my feelings when I was also told that the next morning at eight, Christine was to be sent out with six other chimps to a laboratory for research in infantile paralysis. I was heartbroken about this, and even the thought that the laboratory might not take her because of her small size did not cheer me.

"Well, you, too, can buy her," said Mr. Trefflich jokingly.

The idea fascinated me. Five minutes later I had convinced myself that a baby chimpanzee was what I really needed most in life. After a quick look at my checkbook, I agreed that I would buy her providing she proved to be in good physical shape.

I called a veterinarian friend of

mine in great excitement, and he was kind enough to suggest that we bring Christine over for a check-up. So next morning Miss Taylor took the little ape to the vet's office, and I met them there.

While we were waiting, I held Christine on my lap for the first time, and I was very proud that she would come to me even though she would stay only a few minutes. The examination upset her greatly, and she could only be comforted by Miss Taylor.

One of the chief dangers for chimps here is that they may have contracted t.b. To test this, an injection into the eyelid is given. They don't seem to be as sensitive about their eyes as we are, and Christine never blinked while the injection was given. (I also noticed later on, that she never cared if she had a speck of dust or an eyelash directly on her cornea.) The result of the injection may be seen after 24 hours. In general, if the eyelid becomes badly swollen and red, it means that the chimpanzee has t.b. If there is no trace of any change, the animal does not have the disease. Christine had a very thorough examination and pending the result of the t.b. test was given a clean bill of health. But we had to

wait until the next day to get the t.b. result.

I don't think I slept much that night, and by the time the store opened in the morning, I was down there. Everyone was smiling, so I knew it was all right, but I had to see for myself. Christine was climbing on the bars of her cage, and reached one hairy little hand out to me. She had just started to climb a few days before, I was told, and she seemed very pleased with her accomplishments.

Her eyes were bright and shining, and I was the proud owner of an ape named Christine. She had been given this name in Africa, and among all the shifting and changing through which she had gone, it alone remained unchanged, as if it were a talisman. She would respond to anyone who called her name, so I decided not to change it.

It was a Friday, and I could not go to my farm in Pennsylvania before the following day. It was too risky to take the little chimp home with me, since my apartment was not warm enough. The apes at the pet store were kept at 80 to 85 degrees F., and Christine was bundled up in diapers and a woolen sweater besides. So she had to stay an extra day at the store, while I spent the time shopping for diapers, sweaters, and blankets. I also got a baby crib and a play pen for her.

Saturday I picked her up. She was put in a small carrying case such as is used for cats or small dogs, lined with straw. Miss Taylor was sad to see her go, but she was also relieved to look forward to her first Sunday off in two months. Christine did not struggle or cry when she was placed in the case.

Many small animals find a piece of cloth a companion and comforter and carry it around wherever they go. Some human babies like to do that, too. Christine was a cloth worshiper, and a towel went along with her, tightly clutched in her arms. During the entire three-hour drive, there was not a sound from the back seat where her box stood.



When we arrived, Christine was cold and looked scared. I picked her up and carried her around a while, but she would not put her arms around me, nor would she relax her desperate hold on her towel. From time to time she made a faint worried sound—*hoo-hoo*. When it was time for her formula, she would have no part of it. After one sip, she turned her head away. In her crib she lay holding her towel and staring at the ceiling. It was the same in the evening. She tried her milk but did not like it. She slept a lot, but if I even tiptoed near the room where she lay, she woke up immediately.

Next day, Sunday, she again refused all her meals, so I really started to worry. I tried her on various brands of condensed milk, hoping to find one she liked, but she refused all. She started to develop a cold and by Monday was a very sick baby indeed.

I phoned the vet, who prescribed Aureomycin, and then I called the pet store to find out what brand of milk they had been using. They told me, and fortunately I was able to get it at the local store. Thirty minutes later Christine greedily drank her first bottle, and after three doses of Aureomycin the fever broke as quickly as it had appeared.

The next day, Christine was well and eating. But it took her a few more days to get used to me and to trust me. It was a big day when I came into her room one morning and she greeted me with outstretched arms and an expression that looked to me like a smile.

Christine was about six months old at that time. She had ten of her twenty baby teeth and weighed a little over nine pounds. She could stand and sit only by holding on to the bars of her crib or her play pen, but she started to crawl and was pretty good at climbing. She became engrossed in her new toys. A rattle in the shape of a ring was her favorite. She liked the noise and since her teeth bothered her, she chewed on it a great deal. She was a very cautious baby and would

never touch anything with her hands unless she was sure of it. Even her bottle seemed to scare her, and she would cry when I put her hand on it. It was the same with a spoon, a slice of bread, a cookie, or a new toy.

She slowly calmed down, and after two weeks she accepted her home, and we established a quiet routine. Every morning she awoke at 7:00. She played with her rattle or a stuffed animal and never made a sound. At 7:30 she drank her eight-ounce bottle of formula and played another half hour or so before going back to sleep. At 11:00 she got her favorite food, orange juice and cereal, and then her social hour began. She played, laughed, and climbed on the bars of her play pen, trying to look over the top. Her play consisted of banging her toys on the floor, shaking them, mouthing them, and poking her little fingers into them. After this, she slept soundly until 4:00 or 4:30, when she awoke in time for her last feeding.

By 5:30 she was asleep for the night. Her positions while asleep were about the same as those of a human baby her age. Up to the age of eleven months she would never go to sleep without her towel, even though she was covered by a blanket. At night when she turned over, the towel would slip into a corner; but when she awoke, it was her first thought and she would grope about until she found it. It took her a good while to awaken completely. After she opened her eyes and recovered her towel, she would lie still, sometimes for as long as fifteen minutes. She seemed to notice her surroundings very slowly. Yawning and wriggling about, she would burst into a big smile if she saw me looking at her.

Her sleep seemed full of dreams. At times, she made sucking noises

or laughed, and more than once her terrified screams brought me racing to her in the middle of the night, but she never opened her eyes. I also heard her make loud food or greeting sounds in her sleep.

The heavy ridges over her eyes were warm when she was awake, very cool when asleep. In contrast, her hands and feet were mostly cool when climbing and playing in the warm room (temperature about 75 degrees F.) but became warm when she slept or just lay down and relaxed at room temperature, even with no cover over her. I had expected it the other way around.

The first few weeks were very easy for me, but I am afraid I did not properly appreciate them. I thought I was very busy. When Christine was asleep, I washed diapers and sweaters and prepared the formula and read books on the care of babies.

By the end of June, at 8 months, she weighed 10½ pounds. Looking at her, one would think that a play pen and toys were the most natural things for a baby chimpanzee. Her favorite toy at this time was a little brown Teddy bear. She would kiss it, hug it, bash its head against the walls, or roll on it laughing loudly, and when she got tired, she would use it as a pillow for a short nap. This Teddy bear was her constant companion for several months, until one day she poked out its plastic eyes. From that moment she would

➤ In picking things up, Christine seemed to use her thumb more than some chimpanzees do





CHRISTINE took every opportunity to "medicate" herself with ointment or cold cream.

She tasted each preparation and got the stuff all over herself





▲ SHE had a lot of fun on her swing

not go near it. She always went to the side of the play pen opposite where it lay, as if she were afraid of it. Only when a stranger would pick it up did she show interest in her old friend. She would run up to the person holding the toy and snatch it away, only to abandon it a few seconds later. A little stuffed dog she had and liked lost its eyes in the same way, but she never resented this and kept on playing with it.

She had a little rubber mouse that squeaked, and the noise filled her with terror. It took Christine several weeks to get enough courage to touch it. When she saw that it did her no harm, she quickly became very fond of it and carried it about in her mouth for hours.

Everything found its way to her mouth. She chewed on furniture,

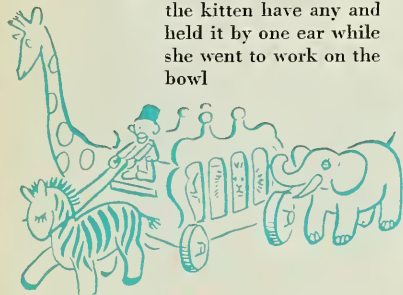
books, floorboards, and pots and pans. She carried the smaller objects in her mouth. Some of her more or less constant treasures were bottle caps, safety pins, matches and spools of thread; and when playing outside, she hardly ever was without a stone in her mouth. It worried me a good deal at first, for I thought she might swallow one, but she would just hold it and then spit it out after a while to make room for a different one. Finally, I realized that a chimp mother couldn't run after her offspring all the time to prevent it from taking sticks and stones into its mouth, so I ceased to worry, though I remember noticing a gibbon mother at the Bronx Zoo sticking two fingers into her baby's mouth, removing an object, and throwing it to the ground.

Christine seems to be much more careful about swallowing things than a human baby. Only once did I actually find her gagging on something she had swallowed. After patting her back and giving her some water, she coughed up a pin. I was horrified, but Christine only seemed glad to have the toy again and cried when I took it away from her. She also eats paper if she finds nothing better, chewing it carefully. About fifteen times a day I tell her "Open your mouth," and with a patient look on her face she opens it a little to let me see that there is nothing of interest in it—only a thumbtack or my watch.

By the end of July, when Chris-



A DISPUTE OVER FOOD. Christine wouldn't let the kitten have any and held it by one ear while she went to work on the bowl





▲ AFTER SOME rough play, the oddly-matched pair enjoyed a rest on the couch

time had reached about nine months, my easy days were over. Christine would not stay in her play pen. She would climb over the top, and I had to have a lid made to put over it when I went out. When I was at home, she would not remain shut up. She would cry and scream, and I could never stand it very long. I would give in and let her wander about the house. This she did at that time on all fours. A month later she started to try to walk upright, but after a few steps she usually lost her balance. At the age of eleven months she walked a good deal on her feet.

Mrs. Bell Benchley in her book *My Friends, the Apes* writes that chimpanzees have to be taught to walk erect. This was different from my experience with Christine. I have never taught her anything except to "shake hands" and say "please" (clapping her hands together), and to wave "bye-bye." The short walks she took in an upright position were of her own volition. She usually carries a toy or towel when she walks this way. When playing outside, she always takes short runs erect and stands upright while playing in the sand or in a little water that is put in the

flat lid of a crock for her. She used to run very fast when upright, as if to keep her balance, but lately she trots along quite leisurely, swaying a little from side to side. It will be interesting to see if her walking improves or if short walks will be all she ever does.

Mrs. Benchley states that chimpanzees pick things up between two fingers, and she says she has never seen them use the thumb when picking up small objects from the floor or from a flat surface. I found that Christine does use her thumb, not as much as we do maybe but enough to make it useful.

When she picks up a grape or small object she seems to use her thumb to steady it, while pushing her index finger against it, or she pushes the object with her thumb towards her fingers, scooping it up with her palm. She picks up large objects in the same way we do, with her thumb and all her fingers. When she was a small baby, she delighted in playing with her tiny thumb and sucking on it. But when she was hungry, she would stick her big toe into her mouth.

The big toe on her left foot must

have been injured once, for there is a very small scar where the nail ends. It was completely healed when I got her, and it seemed impossible that she still felt anything in it, yet from time to time she will look at it and poke at it with her finger with a very serious expression on her face. Sometimes she held her foot up and was not satisfied until I inspected it and made a fuss over it. I am afraid she is a bit of a hypochondriac. Nothing pleases her more than having ointment put on her or receiv-

ing sympathy for every little scratch she has. If she gets hold of a tube of ointment or a jar of cold cream, she "treats" herself with the same serious concentration on her face as when I medicate her.

Recently she has had plenty of salve because of the numerous cuts and scratches she has accumulated. The reason for this is a little kitten, her favorite playmate. Their play together is a rough and tumble affair. They race around the room so fast that I have never been successful in getting pictures of their games. Only when they are both exhausted and climb on the couch for a brief rest am I able to photograph them. The kitten usually gets the better of Christine by using her claws, but recently the little ape retaliated by biting the cat's tail.

It is Christine who comes out of those games with scratches on her hands and face. She fusses over them until ointment is applied. She is afraid of iodine, though, and makes a funny face as soon as I pick up the bottle. I got the kitten so I could observe how Christine would act with another pet in the household.

I opened the box in which the kitten came while Christine



▲ CHRISTINE held the spoon and fed herself, but her hand still had to be guided to scoop up the food

➤ THE morning routine



watched. I was ready to protect the little thing should Christine be too rough with her, but my fears were groundless. Christine gathered the kitten in her arms and hugged her, sniffed her, and kissed her, the way she did with her stuffed animal toys. And the kitten purred. After a few minutes, Christine put her new pet down carefully and walked away to play with something else.

The kitten was soon big enough to be a real companion to Christine, and they both enjoyed each other's company. The kitten could go in and out between the bars and would go right in to play with Christine. I'm sure they passed much time together when I was out. When the kitten got tired, she would curl right up in the corner of the play pen and go to sleep.

It was interesting to see the difference in attitude between the two animals. They did not play together

as equals but rather as a child and a cat. It was Christine who started the games when she felt like it and walked away or ignored the cat when she had had enough. The cat's wishes were never considered. If the kitten did not feel like playing, Christine would allow her no peace until she gave in or hid under the stove. If the kitten should dare to stop the game before her companion was ready, Christine would become very angry and bark at her or slap her. Sometimes she would pick up the kitten and pet her, and the cat liked it and would close her eyes.

Christine is at times very generous towards her pet and at other times jealous. After I have mixed pudding or cake, one of her favorite treats is to lick out the bowl. She sits on the floor and uses a spoon (either end will do), or her tongue, or her fingers. The kitten wants to

share in it, and if Christine feels in the mood, she will attempt to feed the cat with her spoon. Since Christine cannot handle her spoon properly, this is never very successful. At other times, she pushes the kitten away roughly. Yet she thinks it all right to go to the food dish of the cat, and she is indignant if the kitten hisses at her. Christine will not really eat the cat food. She only takes it in her mouth and carries it around for a while.

When Christine was about nine months old, she had but one interest, to explore the house. (I might better say wreck it.) She pulled the books off the shelves, chewed on furniture, crawled into closets to rearrange them, and did all the things described in infant behavior books for children between the ages of 1½ and 2½. But being a little ape, she had some additional tricks of her own, such as climbing on cur-

Continued on page 336

▼ CHRISTINE liked to luxuriate in my bed





By

A. M. SULLIVAN

Drawings by Museum Art Dept.

The ZOO

we didn't ask for

—or, what happens when you close the cottage for the winter

WHEN you turn the key in the country house late in October, you often feel the mixed emotion that comes with the abandonment of a friendly place grown suddenly dour and cold,

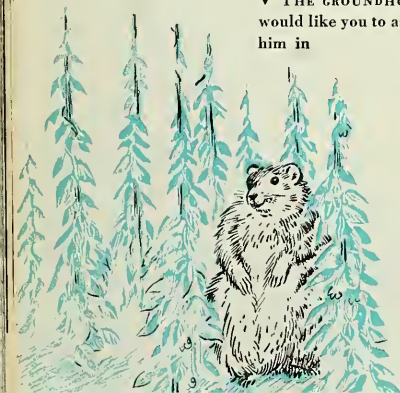
▼ THE GROUNDHOG would like you to ask him in

with the water off, the shades pulled, the doors locked. It would be nice to think that the house was haunted and that friends of other years, impervious to the cold, would sit disembodied in the light of a full winter moon by the frosty fireplace. Our visitors, however, are substantial and three-dimensional, even if they hide in the usual crannies of ghosts.

In our old homestead on the high shelf by the banks of the Musconetcong, we always have tenants of one genus or another during the long break between late fall and early spring, when we arrive to ask another season of gifts from a generous nature. Most of these tenants have a greater privilege in the house than we

who have known the place less than 50 years. The squirrels, wood mice, chimney swifts, bees, and wasps have been familiar with the house for a century and a half, and we gave up trying to dispossess them more than a generation ago.

Our attempt to modernize the homestead has created problems for the winter tenants, and these problems on several occasions have led to dramatic and even tragic episodes. One incident had a far-reaching effect in the social life of the narrow valley that runs eight miles along the river between the Allamuchy and the Schooley Mountains. A party-line telephone may have rewards for the curious, but it is an annoying item when one



of ten subscribers on the line leaves the phone off the hook, either by accident or design. It is especially serious when a departing summer resident is the innocent cause of the difficulty. Not long ago, all the parties to our community listening post found that the wire was dead. The difficulty was reported to the phone company, and after a careful checkup over a two-mile area, our line was suspected. Because the house was locked, the phone repair crew, having more respect for the law than some valley vagrants, cut off our service, thus permitting the neighbors to chat again and enjoy the fun of decoding the rings, which also reflect the mood of the operator.

A few weeks later, I arrived at the house for a February inspection and saw evidence of lesser havoc at the door and windowsills. A chisel-toothed animal had made entry and suffered amnesia. He got in and couldn't find an exit. In a panic he had tried to chew his way through the frames of the window, through the door casing, through the attic floor, but all in vain. Did he succeed in getting out? For a while we didn't know, but by May the morbid stench in the house led us to believe that he had failed. He had been near to success at the living room window, where the wood was almost gone from the edges of the pane, but whether he stopped from frustration or weakness or lack of concentration we shall never know.

The search for the dead animal went on for several annoying and fruitless weeks. Furniture was taken out in the air and examined, bedding stripped, and closets emptied. The aroma of the animal's carcass was taunting and shifting in emphasis. Finally, the casing was pulled from a down pillow, and a gray squirrel fell out—the largest I have ever seen—with a plume that seemed three times as long as the tail of the Central Park squirrels that beg for peanuts. All of our anger and resentment melted

when we beheld the noble creature who had fought so valiantly and who had sense enough to die in bed. He was given a royal funeral the next day with appropriate obsequies by a group of visiting children for whom the panoply of grief offered great excitement and, beyond denial, a bit of pleasure.

Our chimney holds a lively interest for bees and bats and chimney swifts. Smoke from early spring fire is disturbing to these tenants. More than once I have snatched a smoke-bewildered swift from the edge of the flames but not always quickly enough to prevent singed feathers and singed fingers. Nearly every week end, we find a swift in the bedrooms, lost and seeking a way out. These birds are usually weary of beating their wings against the windowpanes; they offer no resistance when you pick them up and open a window to give them freedom. One spring morning I came into the house after several months of absence and saw the light streaming through the bathroom window. The shade was rolled up and

bunched in the center. When I unrolled the shade a dead swift dropped out, and etched on the cloth was a perfect imprint of the bird with outstretched wings.

It was obvious what had happened. Diving for the nearest light, it had struck the shade and jarred the ratchet from its tiny cog. The spring set the shade spinning and gathered in the bird with the accidental cunning of a trap.

We came late one spring, possibly as late as June. Days were warm but the evenings chilly, and a flame in the fireplace offered a comforting breath against the dampness and moldiness of the house. Usually when I start a fire, the brambles blaze up merrily in a good draft, and the heavier logs soon tumble into the lighter embers. But now for an unaccountable reason, the smoke curled back into the room and the acrid cherry branches gave off an odor that irritated our eyes and throats.

To rouse the flame I tossed a small cupful of kerosene on the tinder, aware that I was violating my father's old warning, as well

▼ "YOU CAUGHT the mouse in the refrigerator," my daughter said, "but he's wearing a parka"





▲ IN BURLAP headgear and boxing gloves, our neighbor shoveled the hive from the house.

as plain common sense. The darkness danced with light, and the flames curled out around the edge of the stones; the family, gathered near the hearth, jumped back in alarm. The flames, finding no egress in the chimney, sent threatening tongues into the room, and my children gave me worried and chastening glances.

Suddenly, I heard a dripping sound. The flames drew back their menacing tongues and began to leap into the chimney where they belonged. The drip grew louder, and whatever was falling hissed as it touched the fire. I watched for a moment intrigued and puzzled, and then came the crash. In a moment the flames were snuffed under an oozing mass.

"It's honey," a guest cried, "barrels of honey."

I lit a lamp and quickly verified his statement. The following morning I shoveled out a conglomerate of honeycombs, thousands of bees, brambles and wood ash, and dumped the mess on the riverbank. It was soon discovered by other bees, who promptly retrieved a large part of the honey. The freebooters came from the neighboring fields of clover and from beehives in the hollow hearts of decrepit apple trees, which were then in full bloom.

When we installed electricity in the farmhouse, wiring for lights was the first step. Then came the drilling of a well to provide a constant supply of water under pres-

sure for an inside bathroom and a modern sink. The last consideration was an electric icebox in which we could cache food and chill drinks and keep the butter hard. Late one fall, I cleaned out the box, defrosted the coils, and gave the innards a chance to dry out. Before leaving for the city, we put back a two-pound bar of cheese in a wooden box, turned on the juice, and closed the door.

When I returned in April, I chanced to open the icebox and observed that the cheese was partially consumed and that there was mouse dirt under the coils. I left the door open for a few minutes, hoping that the mouse would jump out of his chosen prison, or at least show himself, but he was not enticed. I came back again in late May to find most of the cheese gone and increased evidence of the presence of a mouse under the coils, which were now heavily encrusted with ice. My daughter had several bars of chocolate and placed them in the icebox to keep them hard while she and her friends went swimming. On her return, she opened the icebox and came to me with her chocolate bars and an injured look. The edges were nibbled at by the mouse, who evidently enjoyed a little variety in his diet.

That evening I set a trap in the icebox, using a bit of bacon rind as bait. My daughter opened the door in the morning, and her howl indicated success.

"Did we get the mouse?" I called from the bedroom.

"No," she said, "I think you caught a baby yak." Before I got down to the kitchen, she said, "It's a mouse all right, but he's wearing a parka."

That was almost true. The fur

▼ THE OUTRAGED bees were reorganizing and coming back in angry echelons



on the mouse looked an inch long, and long hair covered his beady eyes. During his long arctic night, nature had given him added protection as he hid under the icy coils of the box and munched Cheddar cheese without a biscuit to go with it. If he needed moisture, there was plenty, as the condensation had built frosty layers over his head.

A former tenant of the farm was a beekeeper, and when he went away, he took along his hives and a host of queens, drones, and workers. But he couldn't destroy their bee memory of the place. Some of the remaining bees found the hollow boles of apple trees to their liking, but most of them had a feeling of ownership in the old house and built hives back of the clapboards and in the eaves and chimneys. In desperation, they even built inverted half-hives on the face of the house, giving the front a bizarre and debauched architectural design.

How to discourage the bees without destroying them was a problem that stumped the semi-professional apiarists in the valley. My father bought a metal hive one morning and, following some neighborly advice, put a five-pound jar of honey inside to suggest to the bees a transfer of location. He spread a few drops of honey at the opening and was stung by an eager bee trying to dive into the jar.

Father was quite pleased and forgot his pain. "Look how they are crowding in," he said.

That night we listened and heard a faint but not too encouraging hum. "They're asleep," he confided.

I was up first and dashed out to observe the beeline traffic, but I saw nothing to indicate their interest in the preferred hive. Carefully, I lifted the lid, peered in, and saw a few ants cleaning up what honey the bees had left. The rest of the five-pound jar had been added to the combs in the wax mass that disfigured the front of the house like a puffed eyebrow.

Many years later a neighbor with a similar problem decided on a unique and unorthodox method of getting the hive off the house. He cut holes, to see out through, in heavy burlap bags, wore boxing gloves, and padded his clothing. Draped like a monster, he climbed a ladder to the porch roof, shoved the hive from the face of his house, and dumped it into a potato sack. He threw the bag into the rumble seat of an old car and set off on a wild ride worthy of an Ichabod Crane or a Paul Revere. Out on a farm lane, miles away from the house, he lifted the rumble seat and opened the sack. The bewildered bees stormed out and scattered for a few moments.

Suddenly he realized that the outraged hosts were reorganizing and coming back in angry echelons. Like a frightened Martian at the wheel, he drove up and down the road until he lost his pursuers. When our neighbor got home after pausing at a tavern and a few near-by farms to boast of his success, he found the determined bees were back at the old stand. The dispossessed workers from the clover pasture and the remnant campaigners of the chase were hiving over the same old



blemish on the brow of his home. He might have consulted a beekeeper and learned of the necessity of having a queen as a center of interest and identity, but the amateur is often a bit timid about searching out Amazon royalty in the midst of so many valiant supporters of the throne.

The nuts on a tremendous American walnut tree have been a subject of long debate between us and the red squirrels in the neighborhood. My mother made walnut cake for Thanksgiving and Christmas, and we boasted of the special flavor of the walnuts on our tree—the largest tree in the valley and one that a gunstock manufacturer tried to buy for his shotguns. The red squirrels were

▼ SMOKE FROM the first fire of the season always disturbed some of our uninvited guests



adamant. We couldn't have any nuts; neither could the gray squirrels or chipmunks. However, they didn't object to our picking them from the ground after a frost in October, when a convenient north wind shook off the nuts and cleared away the leaves.

When we spread the nuts on the attic floor to dry, we had the futile chore of sweeping up the shells a month later. If we locked them in a spare bedroom, the red squirrels cut a hole in the door at the sill or found a weak spot in the wall. We were about to give up when a friend suggested that we place a galvanized iron pipe across the spare room, a foot from the ceiling and at least seven feet from the floor. From this we hung small flour bags full of walnuts and went back to the city, smug in our confidence that we were outwitting the red squirrels.

A month later we came back, rushed up to the spare room, and saw white flags waving in the disturbed air. They were not white flags of defeat for the red squirrels. Rather they were banners of conquest. Below each empty bag was a heap of shells as evidence of

victory and spoils. What had happened was obvious. The red squirrels, on surveying the project of the high loot, had merely leaped from the floor, clung to the bottom of the bags, ripped a convenient hole with their teeth, and invited gravity to do the rest.

When we were children in the valley, there were no deer. Now there are enough of them to be a problem to the farmer and the truck gardener. The local farm agent suggested a five-foot fence, which was an easy hop for a doe interested in a bean row. One splayfoot mother of a bambi ate 200 cabbage plants in an evening. Her fawn amused himself outside the wire sinking his first teeth into a hundred melons without eating a one. If papa was around, he lingered in the copse of birches.

My neighbor heard of a cure for the nocturnal visits of the deer. "Hang a lantern in the middle of those climbing bean poles, and the deer won't come near the place."

That idea was a tested valley remedy, so we tried it. Sleepless with curiosity, my friend awoke at 3:00 A. M. and stared out into the beanfield. There was a ghostly

▼ THE SKUNK came back and circled me before moving on



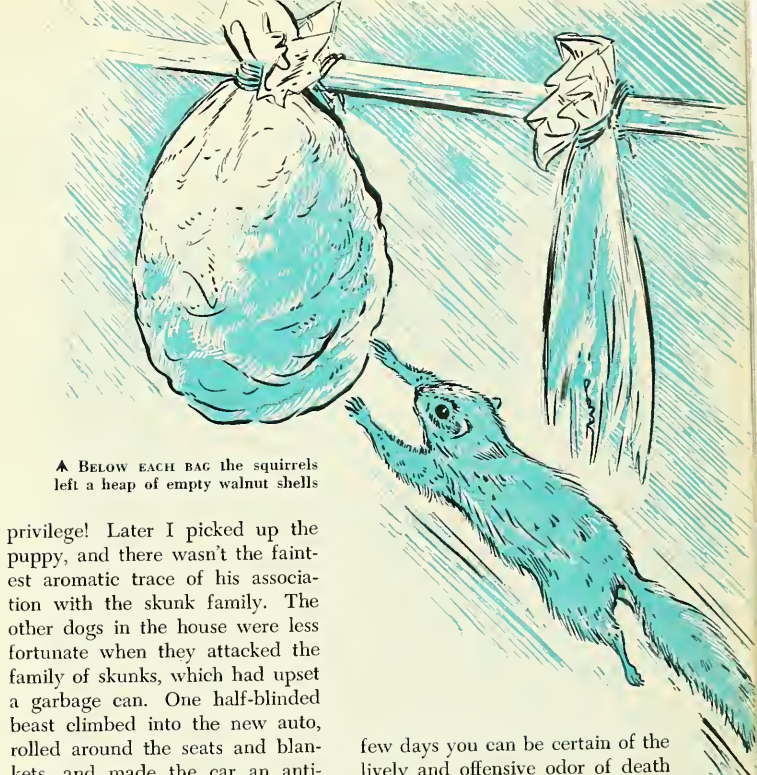
movement as the wind swung the old Dietz lantern back and forth. He got up, jumped into his slacks, and ventured barefoot in the wet grass. There was a faint rumpus, and then he came back, chilled and swearing. Before he went to bed after breakfast, I asked, "How does the lantern work?"

"Fine," he answered, "—for the deer. They were eating beans by lantern light and nowhere else."

The groundhog is a nuisance, but there's something friendly about him. He would like to be one of the family if you would invite him, and it's easily done with cabbage leaves. I saw my brother make friends with a fat, old groundhog in an afternoon by tossing cabbage leaves in his direction. Before the sun went down, he was eating leaves from the boy's hand. The groundhog doesn't care much for tomatoes but will drink the juice out of them in a dry season. I have watched groundhogs carefully take a green or ripe tomato from a vine, drain the juice like a farmer taking a swig from a bucket, then toss the pulp over his shoulder.

The groundhog is a careful appraiser of personal risk, and if he runs away rapidly today without pursuit, he will take more time tomorrow. If there is a dog around, the groundhog is apt to be more wary, but even then he measures his operating area from the security of the hole by the relative speed, size, and ferocity of the dog.

The skunk occasionally overestimates the quality of his repellent, especially on highways. But he wants to be neighborly, even intimate. We had a puppy that scampered into the orchard one morning, and I followed him by the sound of his joyous yapping behind a stone wall. I wondered whether he had encountered a snake, or cornered a young rabbit or pheasant. Leaning over the wall, I was surprised to see him in the midst of a family of skunks, rolling with the kittens and having a picnic, while a tolerant papa and mama restrained their mephitic



▲ BELOW EACH BAG the squirrels left a heap of empty walnut shells

privilege! Later I picked up the puppy, and there wasn't the faintest aromatic trace of his association with the skunk family. The other dogs in the house were less fortunate when they attacked the family of skunks, which had upset a garbage can. One half-blinded beast climbed into the new auto, rolled around the seats and blankets, and made the car an anti-social object for weeks.

The skunk is as inquisitive as he is apt to be friendly. At dawn one September morning, as I waited at the crossroads for a pick-up from a neighbor on the way to the station for the 6:45 to Hoboken, a skunk came leisurely by, paused, looked at me a few seconds, and went down the dirt road for a hundred feet. Then he came back without hesitation, sat in front of me for a worried minute or two, circled me as I stood stiff as a statue, and then went on about his business, as though puzzled why I should stand there at daybreak without a hoe, or fish-line, or sense of direction.

When a weasel invades the walls of the house, it can be a mixed blessing. Rats or squirrels scamper in fright or die in a paralysis of fear. Once a year at least, a weasel pays us an unreported visit, but you know of his presence when there is a wild tumult in the walls and ceilings, followed by a piteous scream and silence. In a

few days you can be certain of the lively and offensive odor of death and no way to get at the corpse except by experimental damage to the house. When it became necessary to replace many clapboards after the removal of a beehive in the walls, I found a dozen squirrel skeletons, some of which testified to the murderous instinct of the weasel, whose merits and demerits must be weighed by the degree of menace he is to poultry and rabbits. A weasel that lived in a woodpile near the house kept us free from rats. We learned this one morning when our terrier chased a field rat into the stacked wood and drove the rat against the fangs of a thin streak of death. I glimpsed the weasel a split second, heard the rat cry, saw him run from under a board and fall dead.

Some of these country house episodes may discourage the city dweller, who is seldom bothered by anything more than the neighbors' children or the invasion of a radio voice; but it's part of the joy of the "old-house-living," especially in retrospect.

A detailed illustration of a tall, square stone tower made of rough-hewn blocks. The tower is topped with a battlement where several archers are positioned, aiming bows. A flag flies from a pole on the right side of the roof. The tower's facade is covered in a grid of small, dark rectangular openings. At the base of the tower, a cowboy in a hat and boots is shown in a dynamic pose, aiming a longbow. The surrounding landscape is rocky and sparsely vegetated with small shrubs. In the background, there are several tall, dark evergreen trees under a pale sky with a few wispy clouds.

New Mexico

A cowboy searching for gold uncovered one of the strangest mysteries of the Southwest — an ancient people who tried to defend themselves in hundreds of towers but perished through fire and violence

By

Charles B. Gallenkamp

*Photographs by the
University of New Mexico Museum*

Vanished Tower Dwellers

HIGH in the rugged mountains of north-central New Mexico, archaeologists are uncovering one of the biggest mysteries in the prehistory of America. There amid towering peaks and jagged mesas have been found the ruins of a civilization that lived and died by violence—a violence so vehement in its intent that it completely erased for seven centuries the history of one of the largest and most important Indian groups in the American Southwest. Buried beneath the earth, lost to time, is recorded the story of a struggle for existence almost without parallel even in modern times. Everywhere there is the charred evidence of death and fiery destruction, for such was the fate of these people and their culture.

Like many archaeological discoveries, this one was stumbled upon by accident. Indeed, it was a Spanish cowboy's quest for gold that led investigators to the remote spot where he had seen strange piles of sandstone slabs, which he called *torreones* (towers). Joe Areano was certain that these piles of stone were not made by natural causes. He had seen slag encrusted on some of the stones, and his imagination was fired to dig for gold, which he believed the ancients had smelted inside the curious mounds. Armed with little more than enthusiasm, the cowboy began his ill-fated search for gold. It ended with only a handful of broken pottery and a fine for excavating on government land without a permit. Worthless though it may have been to Joe

Areano, his handful of pottery cast the first ray of light on the forgotten story of the Gallina Indians.

News of the discovery reached Dr. Frank C. Hibben of the University of New Mexico Museum at Albuquerque, and by the summer of 1934 investigation was in progress to determine what archaeological importance could rightly be assigned to Joe Areano's *torreones*. Intensive exploration of the region showed the ruins to be scattered over an area of almost 800 square miles. They appeared on every pinnacle and ridge that jutted above the canyon floors, but they seemed most thickly concentrated along the Gallina River, which flows from the towns of El Vado and Cuba, New Mexico. Here as many as 500 of the strange ruins were mapped within a small area.

In the years following the discovery, the ruins began to make archaeological sense. Several different types of dwellings were excavated by the University of New Mexico's Field School under Dr. Hibben's direction. There were subsurface pit houses, unit houses, and cliff dwellings; but most intriguing of all were the strange ruins the cowboy had first called *torreones*. His guess could not have been more correct, for that is exactly what they were—huge stone towers resembling medieval fortresses. Without exception, each of the towers excavated bore the same unmistakable evidence of violence and destruction wrought centuries before. There could be no doubt

that the discovery was a significant one.

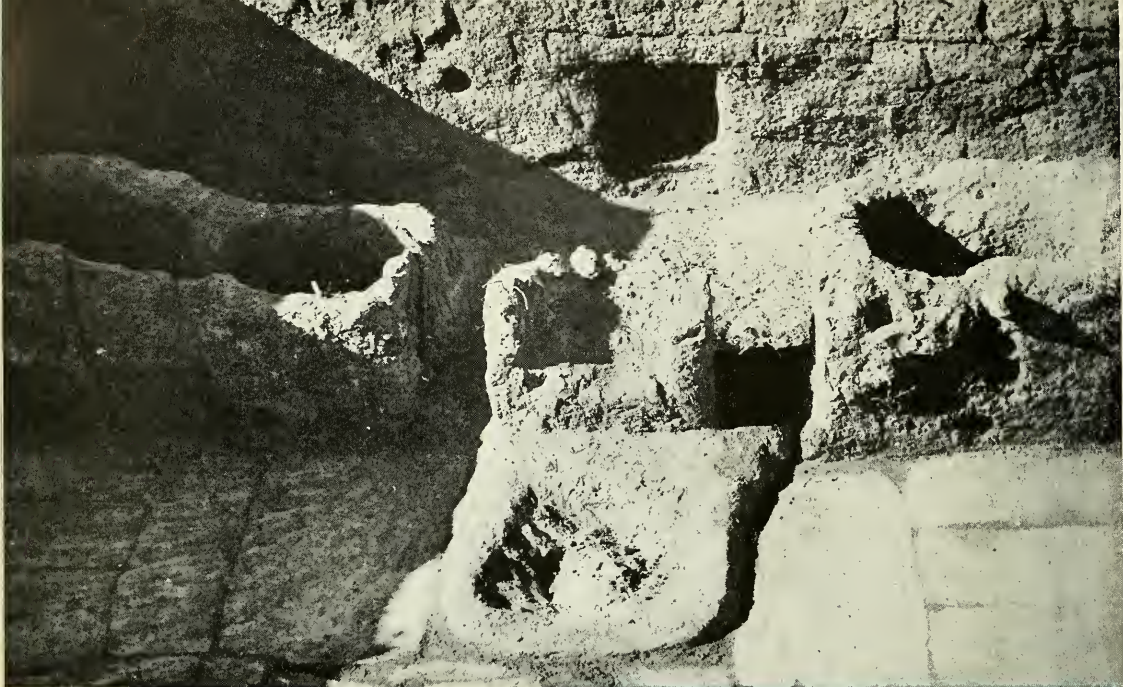
Since 1934, the University of New Mexico Museum has increased its efforts to piece together the story of the stone towers and their builders, the so-called Gallina Indians. They bear this name because the Gallina River seems to mark the center of the ruin area.

Excavations thus far have provided a number of facts and a still larger number of unanswered questions concerning the Gallinas and their fate. They were themselves a peaceful, sedentary people who practiced extensive agriculture in the valleys below their homes. That was no ordinary task, as this part of New Mexico is a region of extremes. Hot, dry winds parch the valley floors during the summer months, leaving little or no water. Even the Gallina River becomes scarcely more than a trickling stream. In the winter, driving snows isolate much of the area and choke the mountain streams with ice. Despite these hazards, the Gallinas managed to cultivate maize, beans, and squash in sizable quantities. Fresh meat was no problem, as the country abounded in wildlife of various kinds.

Gradually a rudimentary Puebloan culture developed among the Gallinas, though they never adopted the use of large multiroomed dwellings as did true Pueblo groups. They had, in fact, little or nothing to do with the large centers of Pueblo life existing at the time. They apparently remained

Drawing by Matthew Kalmenoff





▲ AN EXCAVATED one-room dwelling typical of the unit houses of the Gallina people. In the center foreground is the fire pit, with remnants of the fire screen. On either side are grain storage bins, and in the wall, the ventilating shaft. Stone slabs form the floor



◀ INTERIOR of a pit house, a second type of dwelling used by the Gallina people. It shows the same arrangement found in all Gallina dwellings. A grinding stone stands next to the unusually deep fire pit. A pile of ten badly mauled skeletons was found in the foreground

◀ THE BADLY BROKEN BODY of a pit house defender, whose bones may have been shattered by falling stones. The pelvis is pierced by a large flint point



isolated during the "golden age" of Pueblo supremacy in the Southwest. This isolation can best be explained by their fear of invasion and destruction at the hands of an enemy, whose terror they knew well.

Defense was quite clearly the motivating factor behind the development of the Gallina culture. It determined not only the more obvious facets of cultural progression but penetrated deeply the everyday existence of the people. Information on the religious, social, and economic life of any prehistoric group is at best fragmentary, but the evidence thus far collected would indicate that fear became a dominant force in Gallina life.

The Gallina dwellings were primarily of a defensive nature, built high atop ridges where many miles of the surrounding country could be watched. The topography favored the Gallinas in this regard, as the land is rugged, with high heavily-wooded mesas reaching up from the canyon floors. Often the mesas themselves are scarred with deep canyons that defy exploration. Yet, throughout the rocky expanse of these canyons can be found ruins, many of which are miles from water and tillable fields.

The types of buildings also support the idea of defense. Pit houses, which are partly subterranean chambers with roofs of thatch or adobe, are not easily defended even under the best of conditions. The same is true of unit houses, which have a single room, usually of stone and adobe. The Gallinas made ex-

tensive use of both these types simultaneously, but they evidently realized the ease with which dwellings of this sort might be attacked, as they relied upon their curious towers for defense of the dwelling groups. It was the extensive use of these towers, more than any other single factor, that excited archaeological interest in the Gallina civilization.

The building of towers in any form was not common among primitive peoples of North America, but here are found literally hundreds of them covering the area. They were constructed of crude blocks of sandstone held in place by adobe mortar, and they often exceeded 30 feet in height. This can be accurately determined by the volume of debris at the base. The walls were of double construction, reaching a thickness of six feet at the base. Usually the towers were square or somewhat rectangular in shape, but several round towers have recently been excavated. The towers were entered by means of two ladders made of lashed poles. One reached from the ground to the top of the structure outside. Another led from an opening in the roof down into the tower to the floor below. The outside ladder could be drawn up when the tower was under attack.

The roof construction in all Gallina houses was of a type closely akin to the pueblo roofs: wooden beams crossed by sticks or brush and cemented with a layer of adobe. Often a fighting parapet was built around the top to provide some measure of protection to the

defenders from the rain of arrows that would fall in the event of an attack. The parapet provided a lookout when constant vigil was necessary.

Another type of defensive housing frequently found is that of the cliff dwelling. The Gallinas did not construct cliff houses in the grand manner of their Pueblo neighbors. Again, the emphasis was upon defense rather than comfort. These buildings ranged in size from small single-room units perched high in the rocky canyon walls to larger versions of the multiroomed type, in which each room had a separate means of entrance. The largest and best example of a Gallina cliff house excavated so far is that of the Nogales cliff dwelling buried deep in a canyon near Llaves, New Mexico. It was a two-story structure containing seventeen units.

The extent to which some Gallina families went to ensure defense was fantastic. Indeed, the efforts in this direction made by the tribe as a whole exceed anything else in the known history of the pre-Hispanic Southwest. It is difficult to determine whether the defensive preparations were dictated by a central governing body composed of tribal leaders or left in the hands of individual families.

Whatever the plan, the gigantic effort failed. By the end of the thirteenth century, the Gallina civilization existed no more. A series of invasions swept down upon it. The mountain strongholds were sought out, burned, and pulled down to the last one. Who the invaders were and what hatred or greed impelled them to extinguish the Gallinas remain unanswered questions.

▼ PROJECTILE POINTS of the type most commonly produced by the Gallinas. They are not unlike Pueblo points, though generally not as well flaked





▲ AN AXHEAD was found in this skull, proving that this man fell in combat. He was one of the ten pit house defenders mentioned earlier. Pieces of the wall stones which had been thrown on top of him are here visible

➤ ANOTHER excavated unit house. The storage bins had been badly broken down, and the fire screen between them had been destroyed completely



The material remains found in the Gallina ruins reveal that the culture itself appeared to have come in from another area, probably from the Great Plains to the north. This is substantiated by evidence to be discussed later. Further, the culture seems to have developed its puebloan characteristics after its appearance in New Mexico. Yet, its development was at best very limited. It would almost seem that the Gallinas came under the influence of Pueblo culture early in its development and never carried it much beyond the horizons reached by the earliest Pueblo people. As stated before, very little evidence has been found to show that any complex social or economic interrelations took place between the Gallinas and other groups living in the area. Still, it seems unlikely that a group as large as the Gallinas could migrate into a new region, settle themselves over hundreds of square miles, and not establish some measure of contact with people already in the area or on its fringes.

The years following 1000 A.D. saw the firm establishment of Gallina culture in New Mexico. This period also marked the beginning of the so-called Great Pueblo period. For two centuries there was lively trade and cultural advancement within the Pueblo domain. Complete isolation of any people would have been difficult to maintain, but the Gallinas seem to have come as close to it as possible.

Let us journey back to that day and enter the chamber of one of their structures as it would have appeared when in use. Modern archaeology can reconstruct much of the everyday life of a vanished people from the things found in their homes. This is easily understood when one considers how indicative of our own mode of life are the furnishings and other objects in daily use. In keeping with a simple life, the Gallina dwellings had a basically uniform interior plan. Each dwelling thus far excavated contained a fire pit, fire screen, two or more corn storage bins, and a ventilating shaft. The ventilating shaft was used only to provide fresh air, though it was constructed in much the same manner as a modern fireplace. The shaft was always placed in the south wall of the house or tower. The reason for this was probably religious, though one might first suspect a practical explanation on grounds of prevailing winds and warmth from the sun. The position of many of the ruins deep in winding canyons makes this improbable. It is more logical to assume that the Gallinas attached a religious importance to the idea of an opening to the south. The Pueblos even to this day attribute a similar importance to the east and southeast, and Navajos enter and leave their homes by an opening in the east wall and believe that evil will seek its exit to the north.

The fire pit in the floor was placed near enough to the center of the room to warm all parts. An adobe screen was erected between the fire pit and ventilating shaft to prevent smoke and ashes from blowing around the room. The corn storage bins projected from the east and west walls and were placed on a line with the fire screen. They were also constructed of adobe, and each held several bushels of corn. Occasionally a low bench was constructed around the east, west, and north walls to provide additional bins and shelf space.

The arrangement just described was, of course, more elaborately de-

veloped in some ruins than in others, but in every house the same basic floor plan was used. It is not uncommon to find auxiliary fire pits or storage bins, and a number of ruins have been cleared in which the adobe floors were lined with stone slabs to form a pavement.

Often the adobe-plastered walls were decorated with imaginative murals, done with black paint. These drawings undoubtedly had religious significance and were closely connected with hunting and agriculture. Animal forms, pennants, and treelike designs dominated the artistic imagination of the Gallina muralist. One such mural of extreme interest seemed to represent a tree of life with its branches going out in many directions, ending with a sunburst figure on each end.

Several ruins appeared to have been used for purposes other than living. One round tower had been partitioned off to form seven distinct sections, probably intended for the storage of foods. The center section contained large quantities of burned corn and several grinding stones. The partitions seemed to have been added some time after the tower had been lived in, as the remnants of a fire pit and a ventilating shaft were clearly visible in the floor beneath the partitioned walls. Either the invaders or the Gallinas themselves had set fire to the tower and the precious corn it contained.

The second such ruin was excavated recently near Lindrith, New Mexico, on the western edge of the Gallina country. Here a tower ruin appears to have been erected solely for the purpose of storing corn and similar food products. The floor of this tower was built of logs and raised about a foot above the surface to keep its contents dry. The compartments contained large amounts of corn, as well as grinding stones; and the long healthy cobs indicate that corn grew well in the now harsh climate of this region. It is interesting to note that corn no longer grows in this part of New Mexico. Extreme dryness and frosts early and late in the sea-



▲ A DEFENSIVE TOWER, perched high on a cliff where the surrounding area could be watched for signs of the invaders

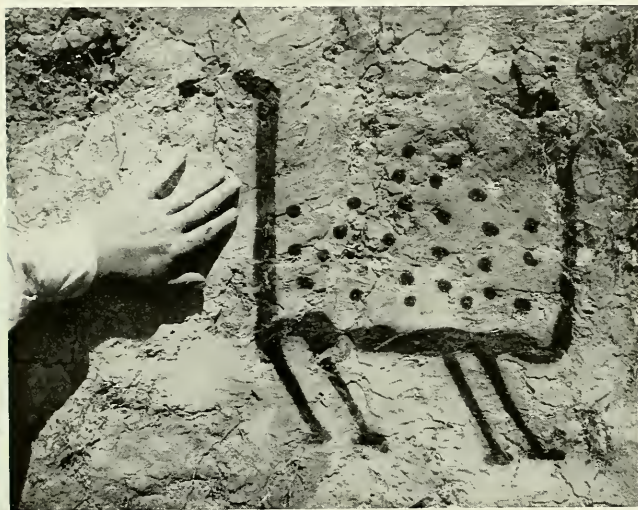
son make its growth too uncertain for farmers now living there.

Remnants of the tower's superstructure show evidence of a parapet from which it could have been defended, but fragments of skeletal material were found outside this granary, indicating that it may have been garrisoned.

Of prime importance to archaeological research in the Southwest is a careful examination of the pottery. Gradual changes in designs or materials enable the student to establish a chronological sequence. Often a careful correlation of pottery types found in different areas will indicate trade routes used centuries before. This fact has been especially important in helping to determine a definite point of origin for the Gallina culture. Pottery found in Gallina ruins generally cannot be compared with the more elaborate specimens from Pueblo sites, although the method of producing it was much the same. Unbroken vessels have shown a varied assortment of shapes and designs, and many more types have since been pieced together from fragments. Characteristic forms include large water ollas, smaller bowls and jars, and vessels for ceremonial purposes. They are almost always gray, with geometric designs in black or brown vegetable paint.

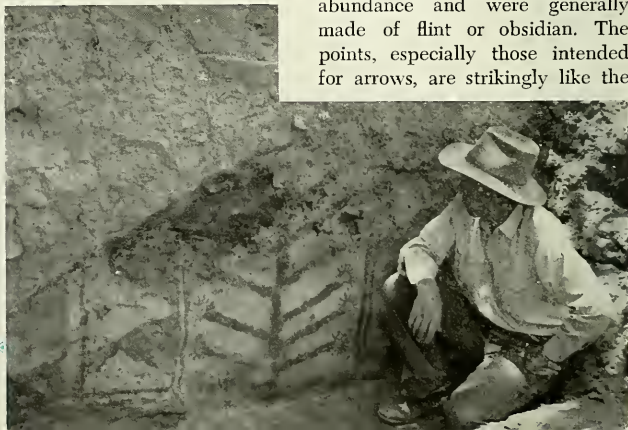


▲ INTERIOR VIEW of a round tower that had been partitioned to form storage compartments. Several bushels of charred corn were found in the central section, along with grinding instruments.



▲ A WALL PAINTING of a deer made with black vegetable coloring in one of the unit houses at Rattlesnake Point. The Gallina dwelling showed many attempts of this sort to portray important game animals

➤ THE "TREE OF LIFE" mural found on the wall of a unit house. Pennant figures like those next to it were often used to decorate the walls



Block designs, animal tracks, and spirals were employed to decorate the pots, and one exceptionally beautiful Gallina bowl was decorated with two lines of triangles forming a cross on the face of the vessel. A number of animal effigy pots have also been found, the most unusual being in the shape of a duck and filled with *Amaranthus* seeds.

Perhaps the most interesting of all the Gallina pottery types, and one that may in time provide a clue to the origin or eventual fate of the culture, are the curious pointed-bottom pots found in almost every ruin. They are tall jars made of gray utility wear with no decoration other than simple incised lines near the mouth. Because the bottom tapers to a gradual point, a depression had to be made in the floor to hold the pot upright. They are very similar to the pointed-bottom pots made by the nomadic Navajo tribes who came down into the Southwest from the north at the close of the great period of the Pueblos.

Thus arises the possibility of a close association, friendly or otherwise, between the newly arrived Navajos and the Gallina tribesmen. There remains, however, much conflicting evidence on this point, resulting chiefly from a possible time gap between the arrival of the two groups in New Mexico.

The stonework produced by the Gallinas was also relatively crude in comparison with that of their contemporaries. Knives, scrapers, and projectile points are found in abundance and were generally made of flint or obsidian. The points, especially those intended for arrows, are strikingly like the

pueblo points and more often show a greater degree of skill and workmanship than the other flaked artifacts. Of the stonework that is singularly representative of Gallina culture, a triple-notched axhead was most distinctive and was extensively used. This implement was rudely fashioned from a well-worn stone and apparently was hafted to its handle by a three-way lashing for increased strength when used for chopping. A number of notched and grooved stones have been excavated, which served to straighten and smooth arrow shafts.

Not until recently had much in the way of effigy or ceremonial stones been recovered. But one unit house has since yielded a remarkable number of stone and clay figurines. They are for the most part crude, but they represent a definite effort to produce objects of better workmanship and religious importance. Coiled basketry and sandals have been unearthed in several ruins and are of fair quality. Occasionally they bear traces of painted or raised designs. One tower excavated soon after the initial discovery of the ruins provided samples of buckskin bags filled with ceremonial face powder, wooden prayer sticks, feather robes, and ceremonial masks and horns. The remarkable dryness of the climate had preserved these objects intact until the inquiring shovels of the archaeologist brought them once more to light.

By far the most interesting and significant remains found in the Gallina ruins are those of the people themselves, for it is from these that the tragic story of the battle between them and their unknown invaders is revealed. The condition of the mangled bodies attests to the fury of the struggle, and in some instances the fire that helped to kill these people has in turn preserved otherwise perishable materials.

In one pit house located on a ridge known as Rattlesnake Point, a pile of ten skeletons was unearthed. The victims had apparently been thrown into the pit together

and fired upon at close range. The fingers and toes of several skeletons were roughly severed in a way that suggested torture before death. The bones were badly splintered by stones hurled down upon the writhing pile, and part of the flaming roof timbers had collapsed on top of them.

Another tower revealed a similar inferno within its walls. The bodies of sixteen defenders were sprawled around the interior. Intense heat from the burning roof and the dryness of the climate during the centuries that the tower was sealed had conspired to preserve the skin, hair, and clothing of its luckless occupants. The body of one woman had fallen backward over one of the corn storage bins. She was crushed by stones from the wall, and in her breast and abdomen were the charred ends of sixteen cane arrows. She clutched a short powerful bow in her left hand, from which part of the string still dangled. A few feet away lay the body of a man with a jagged ax embedded in his skull above the left eye. In the ventilating shaft behind the fire pit were the charred remains of a young boy of not more than sixteen years. He had apparently tried to climb into the shaft to escape the searing flames of the burning roof but had been struck in the hip by an arrow before he reached safety. In a unit house was found the body of a single defender—a middle-aged man whose throat and wrist had been pierced by arrows before he fell amid the collapsing roof from which he had been defending his home. And so it was in every ruin.

The story of violence and bloodshed among these ancients is fantastic in its scope. The battle seems to have raged on and off for two centuries throughout the huge expanse of the Gallina domain. No evidence has yet been found to indicate what became of the survivors, if any, when the struggle drew to a close. Earliest tree-ring dates computed from roof beams show that the Gallinas were building their towers as early as 1003 A.D., but no

dates have been found later than the last quarter of the thirteenth century. From present evidence it seems probable that there was more than one major invasion, possibly a series of them. Indeed, the invaders must have been excellent tacticians, as the storming of these heavily defended, strategically placed Gallina towers was no ordinary task.

The true identity of the invaders themselves may never be known. Perhaps they were Navajos or their warlike cousins, the Apaches. The arrows imbedded in the bodies, however, were exactly like the compound arrows made in the comparatively peace-loving Pueblos. Even the possibility of a civil war among the Gallinas has been suggested, but it is difficult to fathom what kind of hatred would compel such a long and fierce struggle between kindred people.

The exact origin of the Gallinas is still in doubt, but most of the evidence points to the Great Plains as their ancestral home. To begin with, skeletons from the ruins show the Gallinas to have been tall and well muscled. In this, they differed from the short and often stocky Pueblo people. Several ruins have yielded fragments of cord-marked pottery of a kind known in Nebraska and farther to the east in the Mississippi Valley. It has also been found that the Gallinas grew a kind of corn and pumpkin known to the Indians of the Missouri Valley. On the basis of much evidence in this direction, it seems apparent that the Gallina people came to the Southwest from the Plains area, bringing with them a number of their characteristic traits. These naturally were modified by their contact with other people along the way, until they finally settled in the remote canyons of upper New Mexico, built their fortress homes, and awaited their tragic fate. When the whole story is known, it will be a fascinating one. It may take ten years of work to understand fully the riddle of the stone towers, but archaeology is tireless in its pursuit of forgotten things.



IT WAS shortly after moving to Death Valley, where my husband was to serve as Ranger with the National Park Service, that we heard of some strange rocks that had mysteriously moved about the mud surface of a playa, or "dry lake," to use the common term. They were the talk of the Valley. Everyone, whether geologist or layman, was curious about them. How could large rocks skate around all by themselves? They even left trails behind. And they slid rather than rolled.

The more discussions of them we listened to, the more baffled and intrigued we became. Before long we were off to see for ourselves.

The "moving rocks" are located in a high, remote valley in the Panamint Mountains just west of Death Valley. As we approached the playa a band of wild burros gave us a once-over and then rent the desert hush with a raucous heehaw. Unconcerned by the heralding

The Moving Rocks of **DEATH VALLEY**

Huge pieces weighing up to 600 pounds go waltzing around the flat valley bottom, with nobody to push them

By RUTH E. KIRK

All photos by Louis G. Kirk

our arrival had received, lizards and ground squirrels and jack rabbits continued to scurry among the creosote bush and burr sage of the peaceful valley.

The playa is known as the "Race-

track" because of an unlikely tale that Indians once raced their horses there on the smooth, hard mud of the lake bed. Roughly oval in shape and about two miles across, the playa opens northward into the val-

▼ THE TRIP this rock took was a simple one. But it is a sizable chunk, as indicated by the author's foot rule





▲ THE DRY LAKE BED where the stones perform is an oval about two miles wide in the Panamint Mountains west of Death Valley

ley for which it provides ultimate drainage. To the west, south, and east its shores are bordered by the slopes of encircling mountains. The surface is level and even, and its dried, cracked mud is interrupted only by a 60-foot craggy island of igneous rock.

From a short distance, the scene looked quite ordinary to us; but once out on the flat, we were confronted with the astonishing sight we had come to investigate.

What we found was even more impressive than what we had heard. There were hundreds of rocks on the lake bed—from pieces no larger than marbles to some of apple-box size. The complex patterns of the trails they had made fairly shouted the questions: How? Why?

Some of the trails were only a few feet long and perfectly straight. Others measured hundreds of yards and twisted and turned in all directions. It looked as though the peculiar movement had occurred at a time when the playa was wet, the rocks having smoothed furrows in their wakes as they slid along. There were no footprints or other evidence that anyone or anything had pushed them.

In one section we found an abundance of small limestone and syenite pieces weighing from a pound or two up to sixty-six pounds. Although most of these gave no indication of having moved, many others very obviously had. The 66-pounder, for example, must have come from almost a mile away where the only limestone slope bordering the playa was located. It had evidently been in its present position for some time, because 15 or 20 weathered-off fragments lay scattered about it. The trail behind this stone was 142 feet long and absolutely straight, except for one jog 14 feet from the beginning. The width of this trail averaged 12 inches, which closely matched the width of the bottom of the rock.

We examined other stones and found similar correlations between the dimensions of a rock's bottom surface and the width of its trail. Most of the stones were flat and fairly smooth on the bottom; but where they were uneven, the trail invariably showed a corresponding irregularity.

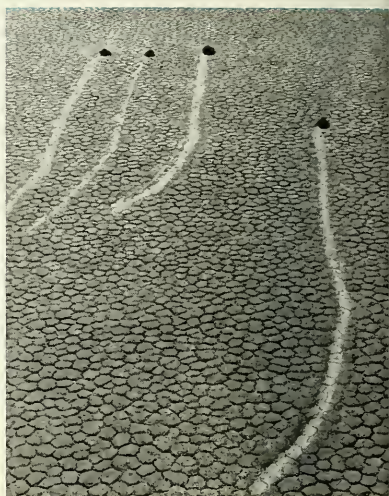
Working our way out from a bluff at the edge of the playa, we counted five blocks of black limestone, each over a cubic foot in size and



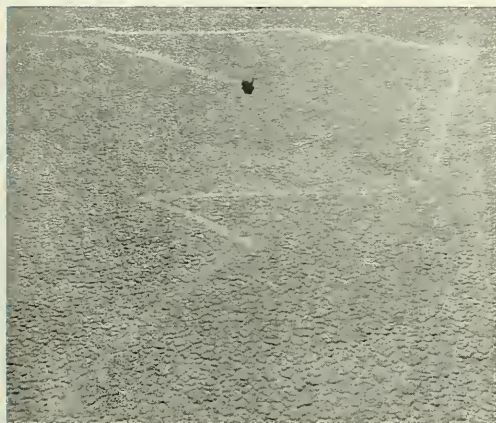
➤ ONE TRAIL WITH TWO ROCKS! The setting sun helped to solve this enigma. Its slanting rays revealed an almost imperceptible second trail



▲ IT IS EASY to drive over the hard mud of the former lake bed but difficult to decipher the tracks. Some, like this one, are short and fairly straight. One of the stones weighed 603 pounds. One of them had traveled 786 feet



▲ SOMETIMES it looks almost as if there had been a race, but in this case the "stones" are only burro droppings



▲ THOUGH the stones seemed to travel most often from south to north, every direction of the compass was represented by their trails



▲ AS STRANGE A SIGNATURE as nature ever wrote. At least three different rocks intersected here to form this cryptic pattern

each with a clear trail. The largest of these rocks measured $7\frac{1}{2}$ feet in girth and weighed 603 pounds. As if not caring to rely on size alone to impress its visitors, this giant had managed what at first appeared a preposterous hoax. Leading due north from it was a trail 220 feet long. That seemed all right. But

at the far end, the trail was blocked by another huge rock. One trail for two rocks! It was too much for us.

But when we happened back to the double-ender late in the afternoon, we found the answer to the enigma, disclosed by the slanting rays of the setting sun. Coming in to the south end of the two-rock

trail, we found a pair of faint furrows. They were so aged and weather-beaten as to have been indistinguishable under the more direct rays of an earlier sun. One of these old trails came in from about 60 feet to the west, and the other was discernible eastward for 90 feet. We surmised that one trail had

been made by the 603-pounder and that the other belonged to the stone now at the north end of the fresh trail. Apparently the two stones had come from opposite directions and stopped side by side. They had remained there next to each other for a time, and then the smaller one had skidded northward to its present position.

The size of these large limestone blocks made them singularly interesting, but their furrows were unimpressive when compared to some we found. The most remarkable trail of all was located not far from the Racetrack's island. It totaled 786 feet! In making it, a 47-pound piece of syenite had executed an intricate loop, crossed its own trail in two other places, and twice made greater than right-angle turns. The first 331-foot section of the trail had apparently been made earlier than the remainder, because it was considerably more weathered.¹

In addition to the now familiar trails with stones at their ends, we found a great many furrows ending in low mounds of dried mud. These trails evidently had been formed when curls of mud had blown along, "snowballing" as they went and leaving trails behind to mark their courses. One of these mud-curl trails was only two and a half inches wide at its beginning but measured twelve feet at its end.

The more we searched, the more we found. The evidence was mounting — and it was puzzling! There were trails varying in length from just over a foot to almost two-tenths of a mile; in width from a few inches to a dozen feet. There were rocks weighing less than a pound and rocks weighing over a quarter ton. Some had made straight trails; some, gently curving trails; some zigzagged or looped. Other trails hadn't even been made by rocks but by mud. Most ran in a general northerly di-

rection, but compass readings indicated that all the cardinal points were well represented.

Still the question: How had the stones moved? We noticed a further clue, and then we resorted to theorizing. Apparently at the time the trails had been made, the playa mud had been soft instead of hard-packed as is usually the case. The Racetrack, as with all playas, is a "dry lake" most of the time, but intermittently it is inundated by run-off from the surrounding area. No weather records have been kept there, but it is safe to estimate that precipitation at such an elevation (about 4000 feet) would exceed Death Valley's inch and a half. Moist conditions easily might prevail several times within a year, either as the result of summer cloudbursts or winter drizzles and snows.

We have found that the lake bottom can become extremely slippery when covered with water—sufficiently so that even a heavy stone could be slid without tremendous force. Beneath the topmost inch or so of soft, wet clay, the ground remains quite firm, thus providing an ideal "rink" for the rocks to "skate" on. Even so, there remained the problem of a propelling force.

The human factor can be completely ruled out. It is inconceivable that anyone should travel to so isolated a spot for the purpose of aimlessly shoving about great numbers of rocks and piles of mud. Explanations such as magnetism and earthquakes likewise can be discounted as not in keeping with the physical evidence.

The most widely held opinion is that the wind—prankster supreme!—is responsible for the antics of the rocks. This almost certainly is the correct answer. Extremely strong, gusty winds are a common occurrence in the Racetrack area, and the prevailing direction is from south to north—the same direction that most of the stones have traveled.

Some geologists have suggested that ice has had a part in moving

the rocks. This idea is based largely upon a certain similarity noticed between the furrows left by these playa rocks and the scour marks found along many lake shores in cold-climate areas. In the latter instance, stones become frozen into ice floes and as the floes move, the imbedded stones sometimes leave furrow marks by scraping bottom.

However, scour marks of this sort are neither as long nor as intricate as the furrows we investigated on the Racetrack Playa, and they could scarcely be likened to mud-curl trails such as we found there. Furthermore, it seems doubtful that desert weather conditions would be such as to favor adequate ice formation.

First advanced by J. F. McAllister and A. F. Agnew of the United States Geological Survey², the theory holding wind responsible has recently received additional support from Dr. Thomas Clements of the University of Southern California³. He and his wife discovered rocks and trails on Little Bonnie Claire Playa, located 60 miles northeast of the Racetrack. In March, 1952, while they were camping in northern Death Valley, a storm came up. After the wind and rain had abated, the Clements drove over to Little Bonnie Claire and there found numerous, clear trails, each terminating in cobbles. The general direction of the trails was from north to south, the same as that of the wind during the storm.

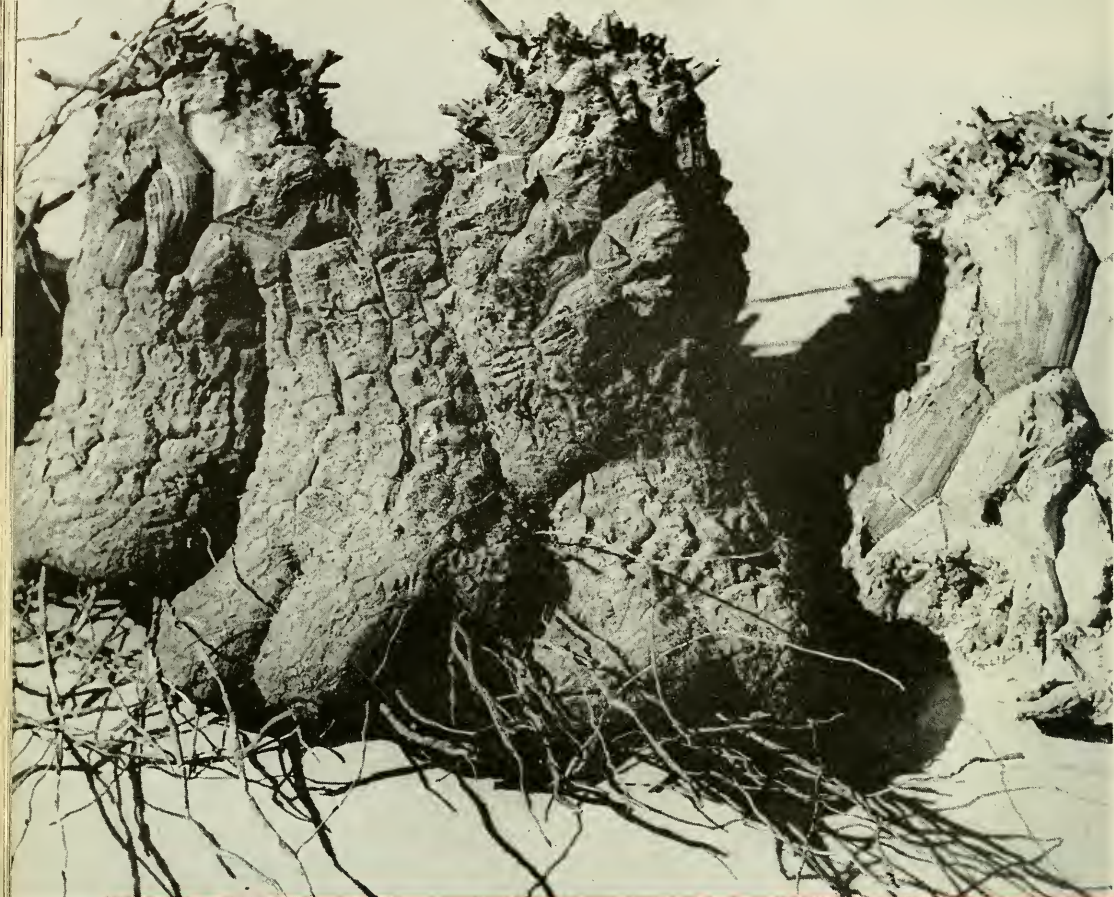
Evidence is accumulating, but the final verdict on the strange rocks of the Racetrack is not yet in. Wind; quarter-ton rocks; erratic, sinuous trails. These are strange associates. What do they add up to?

Fantastic tales of Death Valley are legion. One more mystery can be taken in stride easily enough. But, as a word of advice: Don't get caught out on the Racetrack in a strong wind.

¹Detailed information concerning twelve of the tracks caused by stones and three caused by mud is given in tabular form in Louis G. Kirk's "Trails and Rocks Observed on a Playa in Death Valley, California," in *Journal of Sedimentary Petrology*, September, 1952.

²McAllister and Agnew: (Abstract) "Playa Scrapers and Furrows on the Racetrack Playa, Inyo Co., Calif.," *Geologic Society of America Bulletin*, vol. 59, p. 1377, 1948.

³Clements: "Wind-blown Rocks and Trails on Little Bonnie Claire Playa, Inyo Co., Nevada," *Journal of Sedimentary Petrology*, vol. 22, pp. 182-186, 1952.



▲ WHO CAN DENY that this plant deserves its name, in the plant's scientific name, *Dioscorea elephantipes*.
Elephant's Foot? The similarity is acknowledged even Here the branches have been pruned from the top

The Elusive

Elephant's Foot

A strange assignment in a strange land where the
highways of medicine crossed the byways of botany

By WALTER HENRICKS HODGE

All photographs by the author

"SEND us several hundred pounds of Elephant's Feet" was the request I received while I was on a field trip in South Africa. Elephant's Feet . . . South Africa? Not impossible, you might say. Elephants were certainly abundant there at one time. But the thing that I was to look for wasn't animal but vegetable.

The Elephant's Foot comes justly by its name, for it is a veritable plant pachyderm. It looks very much like an elephant's foot, and it is certainly one of the strangest plants of South Africa.

The reason I had been asked to search for this giant yam (*Dioscorea elephantipes*) was that its tubers might contain a chemical called *diosgenin*. When extracted, this substance can be used in the synthesis of such important and critically short medicinals as sex

hormones and cortisone. Related plants in the American tropics had been found to contain *diosgenin*, so this giant of the genus might also be a source. That's how I got the job to locate several hundred pounds and to ship them home for chemists to analyze.

The task of finding the Elephant's Feet was not as simple as their size might promise. True, the Elephant's Foot is no puny herb that can easily hide from a roving botanist's eye. It produces a giant tuber as much as three feet tall. Unlike most tubers, which are hidden beneath the ground like those of the familiar potato, this one sits upon the very surface of the earth for all who wish to see it. Yet, I was in for a few difficulties.

As soon as I received the request from America, I made a beeline

to local botanists. Surely they would know the location of anything so bizarre. Yes, they knew the Elephant's Foot and had seen it, but it was not too common. Information on exactly where any of the plants could be found proved to be exceedingly vague. Moreover, an ordinance was found to exist in the Cape Province (to whose confines the Elephant's Foot apparently is restricted) protecting it as one of the rare plants of the Cape of Good Hope. Permission to collect scientific samples was easy to secure, but the fact that a protective law existed suggested that vegetable Elephant's Feet might be nearly as extinct here as were their animal counterparts.

Luck, however, then favored me. The Director of the famed National Botanic Garden at Kirstenbosch, near Cape Town, had him-

► COUNTRY through which the search was carried for the plant that might yield *diosgenin*, useful in synthesizing cortisone. This view is typical of the arid South African bushland bordering the Little Karroo Desert near Calitzdorp in the Cape Province



THE ELUSIVE ELEPHANT'S FOOT



▲ IT IS IN rugged desert country like this that the Elephant's Foot is able to live. Unlike most other tubers, its starch-filled mass grows above ground and is protected from the dryness by great corky plates

➤ THE HEAVY corky scales recall to mind the pattern of a tortoise shell. This plant lacks leaves because it is the dry season

self seen the giant yam on several field trips. He not only pin-pointed on my map the localities where I might find it; he even permitted two of his associates to travel with me. Thus, in congenial company, the search was on.

Our destination was Pakhuis Pass near Clanwilliam, about 150 miles north of Cape Town and close to the main road to South-west Africa. Along this route a series of north-south mountains cut through the arid veld land. Pakhuis Pass lies astride the northernmost part of one of these ranges, called the Cedarberg. Winding up from Clanwilliam, the road lifts itself out of the Oliphant's River Valley with its low succulent euphorbias,

or "geel melkbossies," onto the mountain slopes, where heavier rainfall permits a denser covering of plants.

The focal point of our search on the pass proved to be a fantastic jumble of enormous sandstone boulders, strewn as if by a giant's hand along the escarpment. Everywhere, evergreen bushes of one sort or another were prominent, and between them and the impedimenta of the great boulders it was not certain at first whether our objective would be discovered. We had carefully followed directions that we thought would lead us to a single plant hidden among

the boulders. It was almost like looking for buried treasure. As it turned out, we could hardly have missed our dioscoreas. Once our specimen was found and its characteristic appearance noted, it was no problem to locate dozens of Elephant's Feet. Even from a distance, the bluish-green leaves set them apart from the surrounding vegetation. Instead of being rare, they were as abundant locally as any of the other species at this 2000-foot level on the Pakhuis Berg.

At that, our first Elephant's Foot was something of a disappointment, for with only a 20-pound



tuber it was nowhere near the size I had seen cultivated in gardens. But it was a genuine Elephant's Foot, from its tangle of short branches to its big tuber sitting there on the ground, pedestal-like and covered with great irregular corky scales. A halfhearted kick was sufficient to dislodge it, for the bottom of the tuber was as flat as a platter and anchored to the ground only by an irregular ring of rather coarse roots. When held in the hand, it certainly called to mind a real elephant's foot. Nor was it difficult to see why the great corky plates covering the tuber had reminded early visitors in this part of Africa of a tortoise shell. The similarity was also appreciated by botanists, who for years used the classical but no longer acceptable generic name of *Testudinaria* ("like a tortoise").

This was May at Pakhuis Pass, and the more abundant rains of the fall season had already begun. During much of the year, there is little precipitation and the great terrestrial tubers lie dormant, their branches naked of all greenery. Unlike most dioscoreas, which are vigorous and extensive climbing plants, the Elephant's Foot produces only short scraggly branches, which at times lean upon neighboring plants for support. These branches, with their quarter-sized, kidney-shaped leaves and insignificant flowers, appear very quickly after rains. This rapid activity after a few wet days is made possible by the wealth of starchy food material stored in the giant cork-plated tubers. At the Pass a number of plants were already green and in addition were sporting lateral clusters of tiny yellow flowers. The sexes of the Elephant's Foot are separate; certain plants produce only male flowers and as many others only female flowers.

The tuber has given this species a chance to survive in a region of scant and erratic rainfall. The Elephant's Foot is but one of some 650 species of *Dioscorea* known in the world, yet it is probably



▲ THE ELEPHANT'S FOOT is poorly anchored to the ground. A kick of the foot may be enough to break the roots through which it gathers the mineral nutrients it needs from the soil. Unfortunately, chemical analysis did not show that the Elephant's Foot could provide medicinal substances in commercial quantities. Also, it grows too slowly to be a good producer. It is to be hoped, therefore, that this curiosity of the plant world may be preserved from extinction by enforcement of existing laws

the only one that has managed to live under such arid conditions. Most dioscoreas are tropical and inhabit regions of ample rainfall. Their variously shaped tubers are usually tucked underground for better protection. In arid country, where the ground is often baked hard by the sun, the Elephant's Foot finds this difficult to do, and so as a means of protection above the ground the thick corky scales

apparently have been evolved. This corky coat is as efficient against excessive evaporation as the cork stopper in a bottle of liquid. Unfortunately, the plates of the plant's scaly armor are not as tough as the bony scales of a tortoise, and it is not uncommon to find a tuber with a large gaping hole opened by some hungry animal that had eaten some of the starchy flesh.



▲ THE STEMS of the Elephant's Foot always twist around a support in a clockwise fashion. Therefore, it is called a "left-handed" liana. The tiny flowers are yellowish. This plant is climbing upon a neighboring aloe

➤ THIS ELEPHANT'S FOOT probably weighed over 150 pounds and was a century or more old. Note the small kidney-shaped leaves scattered among the old branches

The interior of this big yam has been compared to a turnip both in consistency and color, but no mention has been made of the flavor. Yet primitive man at least has not disdained eating it, and several early visitors to South Africa make brief mention of its use by the aborigines. One of the first written observations was by a Lt. William Paterson. In October, 1778, while traveling in "Bokke Land" (a locality apparently not distant from Pakhuis Pass), he records: "I there found many curious plants, among which was one called Elephant's Foot. I could find none of them in flower. . . . It has a large solid bulb, which sprouts to the height of five or six feet, and afterwards shoots out into small climbing branches with roundish heart-shaped leaves. The natives eat the root, which they esteem very salubrious."

Thirty-four years later and three hundred miles farther east on the



other side of the Karroo, in the mountains near Graaff-Reinet (then a frontier town), the botanist William Burchell saw "an extraordinary plant called Hottentot's Brood [Hottentot's Bread]. Its bulb stands entirely above ground and grows to an enormous size, frequently three feet in height and diameter. . . . The Hottentots informed me that, in former times, they ate this inner substance, which is considered not unwholesome, when cut in pieces and baked in the embers. It will easily be believed that this food may not be very unlike the yam of the East Indies. . . ." The Elephant's Foot or Hottentot's Bread is apparently no longer utilized for food, and from Burchell's statement one guesses that, although edible, it was never very popular. At most

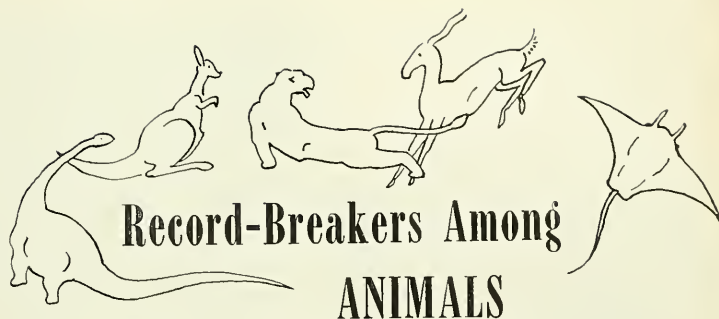
it was probably eaten as a kind of emergency food.

Burchell describes some especially large-sized dioscoreas. Those I found at Pakhuis Pass were much smaller. Later, on subsequent "elephant" hunts to other areas in the Cape Province, I located plants fully as large as Burchell's Graaff-Reinet specimens. Wherever these plants were seen in South Africa they were abundant, at least locally, and their reputed rarity must be ascribed to the fact that no one has ever hunted them systematically. *Dioscorea elephantipes* ranges for about 500 miles, all told, from the mountains near Clanwilliam east to the vicinity of Grahamstown. It is found nearly always in the slightly wetter hilly country (1000 to 3000 feet) fringing the dry Karroo.

The giant tubers are seemingly as varied in shape and size as the rocky hills in which they occur. Sometimes they are flat and plate-like and hug the ground closely; at other times they become tall irregular cylinders. At Vogel River in the eastern Cape, I have seen "granddaddy" tubers weighing well over 200 pounds, but always associated with them are scores of youngsters of all sizes, scattered unobtrusively among the stones. Growth is probably extremely slow, and these wizened old plant folk of the veld may be a century or two old, if we are to judge from what few observations have been made. It has been shown that at three months of age an "infant" tuber is the size of a pea and just as smooth, while a small "adolescent" tuber grown in a greenhouse in England was four inches in diameter when five years old. The growing conditions there were probably favorable. Old plants have been transported from the wild to gardens in South Africa and elsewhere as curiosities, and although they continue what appears to be a normal existence under the circumstances, it is often impossible to see any appreciable change in size.

Such slow growth would certainly not recommend the Elephant's Foot as a growing crop for the production of cortisone. And so it was perhaps just as well that the hundreds of pounds of great vegetable "feet" that finally found their way into the "brews" of the analytical chemists in America showed no commercial quantities of the much desired *diosgenin*.

Yet the urge to gather Elephant's Feet in South Africa goes on. People not aware of the facts would like to see all the Elephant's Feet taken. We'd better leave these elusive plants in the karroid bushlands where they belong before they really become rarities. Uncontrolled collection of these giant yams would soon deplete the arid veld of one of its most interesting vegetable curiosities.



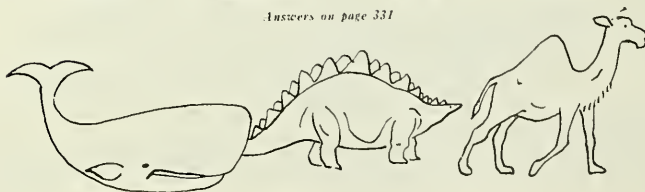
Record-Breakers Among ANIMALS

By OSMOND P. BRELAND

Listed below are 20 questions relating to some extreme features of certain creatures of the animal kingdom. Five points should be counted for each correct answer. A score of 60 is fair; 65 to 75 is good; and 80 to 90 is excellent. Scores above 90 will be made by only a few zoologists or Quiz Kids.

- The largest animal that ever lived is a
A. Mammoth C. Whale
B. Dinosaur D. Mastodon
- The animal that lives the longest is
A. A tortoise C. An elephant
B. A whale D. A carp
- The animal that can run the fastest is
A. An antelope C. A deer
B. A cheetah D. A greyhound
- The fastest flying bird is
A. A duck hawk C. An Indian swift
B. A carrier pigeon D. A bald eagle
- The largest fish is
A. An ocean sunfish C. A manta ray
B. A tuna D. A whale shark
- The bird with the greatest wing spread is
A. An albatross C. A pelican
B. A condor D. A vulture
- The longest snake is
A. A boa constrictor C. A python
B. A king cobra D. An anaconda
- The smallest creature in the animal kingdom is a
A. Protozoan C. Coral
B. Rotifer D. Worm
- The largest creature without a backbone is a
A. Giant squid C. Giant crab
B. Giant clam D. Lobster
- The smallest creature with a backbone is a kind of
A. Reptile C. Mammal
B. Fish D. Amphibian
- The mammal that is smallest at birth is
A. A mouse C. An opossum
B. A shrew D. A pika
- The bulkiest insect is a
A. Giant fly C. Beetle
B. Bee D. Walking stick
- The smallest living mammal is a kind of
A. Chipmunk C. Mouse
B. Ground squirrel D. Shrew
- The largest amphibian is
A. An African bullfrog C. A hellbender
B. A Japanese salamander D. A siren
- The longest venomous snake is a
A. King cobra C. Bushmaster
B. Diamond-back rattler D. Fer-de-lance
- What animal has the sharpest eyes?
A. Goldfish C. Insect
B. Rhinoceros D. Bird
- The animal with the longest horns is a
A. Buffalo C. Deer
B. Mountain sheep D. Mountain goat
- The longest insect in the world is a kind of
A. Beetle C. Katydid
B. Grasshopper D. Walking stick
- The part of the mammalian body that has grown to be the longest, considering all species of mammals, is
A. An antler C. A claw
B. A horn D. A tooth
- The smallest insect in the world is a kind of
A. Beetle C. Termite
B. Wasp D. Butterfly

Answers on page 331



➤ DEEP-SEA DIVER submerges to be photographed among the wonders of the ocean floor in "The Sea Around Us"

▼ SUBMARINE FARMER—sponges grown on the ocean floor are a profitable crop for this underwater farmer in "The Sea Around Us"



The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

BECAUSE of the wide circulation enjoyed by Rachel Carson's book "The Sea Around Us," movie goers are bound to have some preconceived ideas about what they expect from the movie by the same name, purported to be based on it. Our reviewer and oceanographer,

Dr. Robert Cushman Murphy, comments: "The Sea Around Us" (R.K.O.) includes some of the finest marine natural history ever filmed in color. The 'blossoming' of flower-animals, the hues and pulsations of various small invertebrates, the reproductive processes of sea turtles,

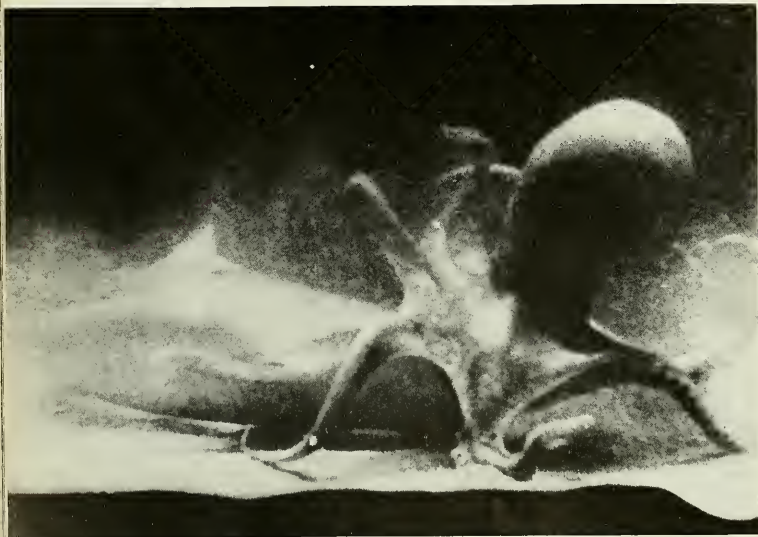
and the superb shots of killer whales are all examples. For such offerings it should be seen and enjoyed.

"Despite its excellent features, it is as a whole a highly disappointing production. The fact that it possesses little consonance with the book from which it takes its title may be unimportant. But it is also virtually devoid of any substantial information concerning the physical forces, chemistry, or ecological chains that form the basis of life in the sea. Half or more of its scenes are long-winded, many of them smacking of already over-worked aquarium photography that possesses nothing fresh enough for a highly advertised full-length leader. Furthermore, it creates or fosters various erroneous ideas. Its man-shark and shark-octopus encounters, and the effort to attribute 'ferocity' or anything more than incidental or unlikely danger, to the manta, are staged, horing, outworn, rehearsed, nauseating rubbish.

"The introductory scenes of 'The Sea Around Us' illustrate imagination without judgment. The primordial face of the cooling earth, before the eons of heavy rainfall, is shown as a landscape deeply eroded by pluvial action!"

"'White Witch Doctor' (20th Century-Fox) is fiction with an African background," writes Dr. Harold E. Anthony, Chairman of the Museum's Mammalogy Department. "It is a good compromise be-

▼ DEATH STRUGGLE between an octopus and a shark





▲ SUSAN HAYWARD and Robert Mitchum star in the African film, "White Witch Doctor"

tween fact and fancy, for the action is plausible and little is introduced into the African environment that is out of harmony.

"The plot is somewhat suggestive of Rider Haggard, with a treasure of gold guarded by hostile natives, a medical mission where a young, registered nurse wins her way into the hearts of the local tribes, and white adventurers who would use any means to get at the gold.

"The acting is good, and the photography is realistic and convincing. Some shots are against back-drops, but the sense of illusion holds and there is enough bonafide footage on location to carry the interest along.

"Things might very well happen as this film portrays them. There is a good ending and some very interesting and unusual glimpses into primitive Africa. This film is good entertainment."

Brief comments on films previously reviewed

Documentary and Grade A

The Alaskan Eskimo

The first in a series of films on people by Disney

Straight reporting on a single Eskimo community, where something of the old way of life survives

Below the Sahara

African wildlife film made on location

Interesting sequences of African fauna and native peoples. Authentic flavor

Prowlers of the Everglades

A Disney True-life adventure film

Fine natural history, which loses none of its drama by being factual

Down the Alphabet

Genghis Khan

His life. Filmed in Philippines, with Philippine actors and language. English narration

Many technical faults. Musical effects and acting give valid Mongol impression

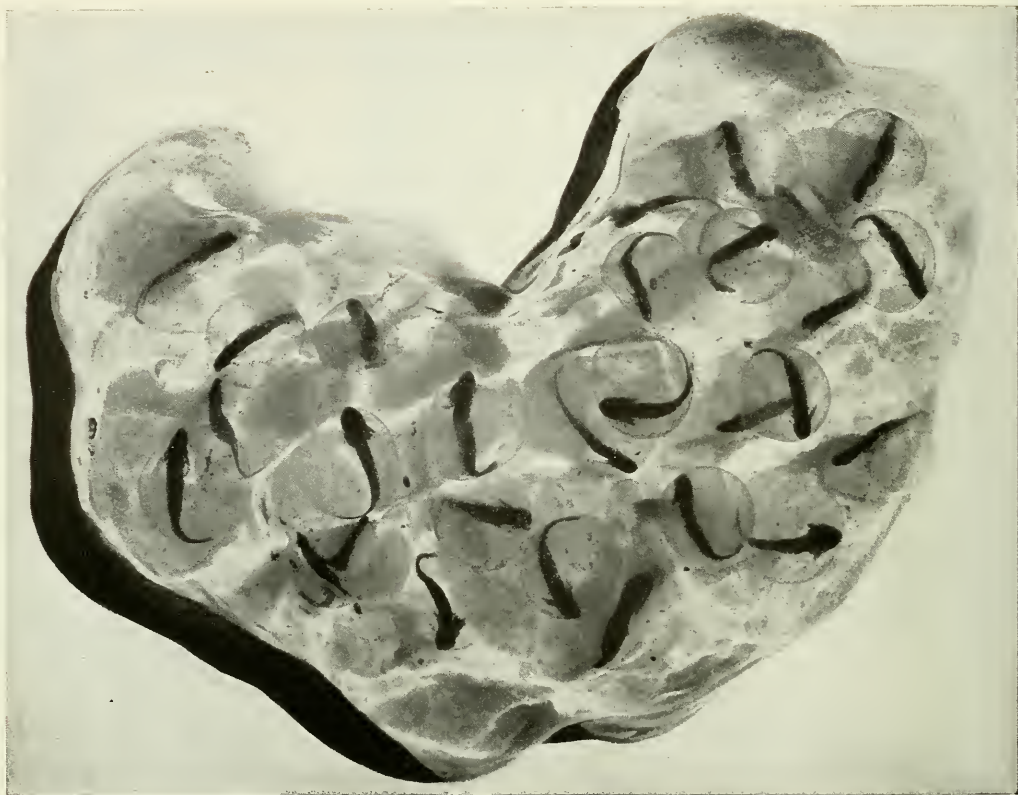
Answers to Quiz:

"Record-Breakers

Among Animals"

on page 329

1. C. *Whale*. Specimens over 100 feet long have been captured. The dinosaurs were neither so long nor so heavy as a blue whale.
2. A. *Tortoise*. One giant tortoise is thought to have lived 152 years. Some may have lived as much as 200 years.
3. B. *Cheetah*. Cheetahs can often catch the fastest antelopes in a short race. They have been timed at 70 miles per hour.
4. C. *Indian swift*. These birds have been timed at speeds of from 170 to 200 miles per hour. It is possible, however, that other swifts and several other kinds of birds may prove to be capable of about the same speed.
5. D. *Whale shark*. One 45 feet long has been measured. May possibly grow to more than 60 feet.
6. A. *Wandering Albatross*. Several of 11 feet 4 inches have been measured. Larger condors have been reported but not verified.
7. C. *Python*. A regal python of 33 feet is on record. The anaconda is heavier, but none as long as the regal python mentioned above have been confirmed.
8. A. *Protozoan*. All have only one cell in their bodies. Most cannot be seen without a microscope.
9. A. *Squid*. Giant squids 55 feet long have been found.
10. B. *Fish*. The dwarf pygmy goby of the Philippines has a body length of only two-fifths of an inch when fully grown.
11. C. *Opossum*. When first born, young opossums are smaller than a honey bee. After birth they continue development in the pouch of the female.
12. C. *Beetle*. The champion insects for bulk are probably the Goliath Beetle of Africa and the Hercules Beetle of South America. They are more than 6 inches long and husky besides.
13. D. *Shrew*. Some have a body length of 1½ inches and a weight of less than half an ounce.
14. B. *Japanese salamander*. Some specimens are over five feet in length and weigh almost 100 pounds.
15. A. *King cobra*. There is one authentic record of one more than 18 feet long.
16. D. *A bird*. Particularly the birds of prey have unusually sharp eyes and can spot their victims at unbelievably great distances.
17. A. *Buffalo*. Indian buffaloes have been known with horns over 6 feet long.
18. D. *Walking stick*. Some tropical species grow over 12 inches long.
19. D. *Tooth*. Elephant tusks, which are really teeth, of more than 11 feet are on record. A tusk of an extinct mammoth has been found that measured over 16 feet.
20. B. *Wasp*. Certain minute wasps that live in the eggs of other insects are less than 1/100 of an inch long. Some beetles are almost as small.



THIS interesting photograph was submitted to NATURAL HISTORY Magazine by Clifford Matteson. The fact that he photographed the eggs near Cowlesville, New York, on May 13 makes us reasonably certain that they were laid by the Jefferson Salamander, *Ambystoma jeffersonianum*.

This is a moderately large salamander, sometimes reaching a length of $7\frac{1}{4}$ inches. It is a secretive salamander, and though many individuals may be drawn to a single small pond for mating and egg laying, the migrations usually take place at night and consequently the animals are not frequently observed.

Their courtship occurs in late March or early April, and the male deposits several small pyramidal, transparent blobs of jelly, each capped by a whitish mass that contains numerous male germ cells.

Unhatched

Salamanders

An unusual photograph of the egg cluster of the elusive Jefferson Salamander

By CHARLES M. BOGERT

*Curator, Department of Amphibians and Reptiles,
American Museum of Natural History*

These are picked up by the female, and she is then ready to deposit her eggs. She crawls about the pond in search of a suitable underwater support, usually the stem of an aquatic plant or even a twig. She ordinarily selects a support that is no more than six inches below the surface.

She expells the eggs one at a time, but the sticky outer layer causes most of them to adhere to the support or to other eggs already

laid. Often she hitches herself forward so that there may be several clumps deposited at intervals along a twig or stalk. After laying her eggs, the female returns to the near-by land, where she can sometimes be found hiding under logs or loose pieces of bark.

The eggs measure a little over one-sixteenth of an inch when laid, but they quickly absorb water and become twice that size. They continue to increase in diameter as

the larvae develop. A month or so is required for incubation, so that hatching usually occurs during the latter part of April or the first two weeks in May. When the young salamanders have reached a length of about two inches, during the late summer or fall, they lose their gills and take on more or less the form of an adult.

It is evident that the eggs in Mr. Matteson's photograph were almost ready to hatch. The larvae are about half an inch long when they break loose from the transparent membranes. At that time, the gills are well developed, but the forelegs are little more than rod-shaped buds and the hind legs are not discernible.

There is a club-shaped "balancer" on each side somewhat below the level of the eye and gills at the time of hatching. These organs are used to support the body on smooth surfaces or when the larva suspends itself from bits of algae or water plants. Each balancer begins to constrict at the base in about two weeks and drops off, leaving a rounded knob that soon disappears.

These larval salamanders can be distinguished from the tadpoles of frogs and toads by their conspicuous gills. While the gills of tadpoles can be seen during the very early stages, a few days later a fold of skin grows back over them. They are then replaced by shorter, fishlike gills, hidden behind the flaps of skin. Also, the tadpoles are equipped with a horny beak and teeth that are lost at the end of their larval period, along with the tail and gills. Salamander larvae, on the other hand, are equipped with a broad mouth and true teeth. They continue to acquire more teeth as they mature, retaining the tail throughout life—barring accidents. The tail, as well as the limbs, can be regenerated in salamanders, but if a frog's leg is nipped off, it is gone for good.

Many salamanders, of course, lay their eggs on land, and the hatching then emerges minus its gills but fully equipped with limbs.

UNHATCHED SALAMANDERS

BOOKS

Continued from page 294

Based on the premise that the scientific developments of the past will undoubtedly continue at an accelerated pace, the authors show how further expansion of research along lines whose course is already clearly indicated can solve all man's resource problems. This can be done by producing food independent of plants or animals, by utilizing energy directly from the sun, and by exploiting raw materials from such virtually inexhaustible substances as the sea and air.

To most laymen this book will undoubtedly be quite an eye opener. To young people it will indicate the tremendous opportunities that await them. If it induces more of them to enter the field of research, the authors will undoubtedly feel that the book has accomplished its purpose.

Unfortunately, the millenium envisioned by the authors is not likely to come soon. Research efforts of the magnitude required have virtually never been made by free people except under the stress of war, and even then only toward a very limited objective. Our present research along the lines with which this book is concerned is largely supported by meager grants from a few far-sighted philanthropists and foundations and is wholly inadequate for the task.

RICHARD H. POUCH

BIRDS OF MEXICO: A GUIDE FOR FIELD IDENTIFICATION

— by Emmet Reid Blake
University of Chicago Press,
\$6.00, 644 pp., 330 illus.

SOME 750 species of birds are resident in Mexico, a number which exceeds the combined total of the United States, Canada, and Alaska—a vastly greater area. Nearly 500 of these Mexican birds do not occur in the United States, and among them are many that will dazzle even the most blasé tourist: incredibly noisy flocks of green and yellow parrots; toucans with immense, gaudily colored beaks; swifts the size of small falcons, cleaving the air with rocket-like velocity. Emmet R. Blake has now provided a much-needed field guide to this parade of the feathered kingdom. By skillful use of keys and short descriptions of plumage and habits Blake, who is Associate Curator of Birds at the Chicago Museum, has made it possible for anyone to identify most Mexican birds in life. Numerous illustrations by Douglas Tibbitts, staff artist at the Chicago Museum, are a useful supplement to the text.

The emphasis in this handbook is wisely placed upon the species and not upon the races or subspecies. The latter are listed and brief ranges given, but even

this passing notice might well have been omitted and the space used to give fuller ranges for the species. At the present time the range is given only for Mexico; in the case of the numerous species which extend into Central America a complete distribution would have been useful inasmuch as this book will have to serve for the present as the only reasonably complete guide for the birds of Central America as well as Mexico.

Blake and a group of advisers have given great care to the important problem of choosing a suitable common English name for each species. Uniformity in such usage is essential, for the use of scientific names by the general public has never met with favor. All in all, Blake's *Birds of Mexico* is an excellent guide book and should prove a boon to the ever-increasing number of visitors who enter Mexico each year.

DEAN AMAOON

THE END OF THE WORLD

— by Kenneth Heuer
Rinehart, \$3.00, 220 pp., 8 illus.

ALTHOUGH the theme of this book is as old as man himself and has been the subject of numerous Sunday supplement articles, Mr. Heuer presents it in a scholarly fashion that makes interesting reading.

In the first chapter he reviews some of the early prophecies of the earth's end based upon various interpretations of the Bible. Fortunately, however, the dire predictions failed to materialize in every instance.

The next four chapters outline many of the currently popular astronomical theories regarding the possible fate of our planet. These include such sensational happenings as the collision of comets or asteroids, the possible near approach of the moon, the ultimate fate of the sun, and the probability of another star colliding with it or approaching dangerously near.

In view of the available evidence, most astronomers seem to be of the opinion that the destruction of the earth by such means is far too remote to cause any real concern at present.

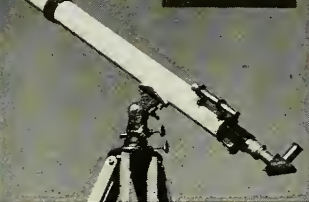
After dealing with these probabilities, however, the author describes what he considers a far more likely and possibly imminent danger. This is that man may bring on the destruction of his present civilization through the agency of the atomic bomb or the H-bomb. In his estimation, and that of many in a position to know, it is of ultimate importance that all nations consider the terrible consequences that can ensue if we do not take immediate steps or turn our present energies to peaceful rather than destructive ends.

ROBERT R. COLES

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LETTERS

continued from page 289

He could have bought any number of the manufactured blankets at prices lower than he paid, whereas every Navajo blanket is unique. There never was and never will be two alike. No Navajo will ever duplicate his own design or that of any other weaver.

C. J. STAHLY

Sarasota, Fla.

Mr. Stahly is quite right. Many a non-Navajo blanket blankets a Navajo.—Ed.

Err-otter

SIRS:

In the movie section of your June issue, the description under a picture reads, "Otters and alligators play leading roles in Disney's 'Prowlers of the Everglades'."

The otter looks like a raccoon, or am I wrong?

ALFRED L. GOLDMAN

New York, N. Y.

The caption is correct; the picture is not. Raccoons as well as otters are in the movie; but the coon is more of a busy-body and he poked his face into the magazine when no one was looking.—Ed.

Television

See the American Museum television program "Adventure," presented every Sunday from 6 to 7 over a broad network.

Consult your paper for channel.

With the Insect Hunters

Dr. and Mrs. Charles Vaurie, of the scientific staff of the American Museum, are expected back from a collecting expedition in Central Mexico, before this issue of NATURAL HISTORY is off the press. Their journey will aid in a broad study the Museum has undertaken on the insects of Mexico and Central America and their interrelation with those of the United States. This study will be of interest not only to insect scientists but also to students of public health and genetics.

The Vauries will conduct their field work in areas that have been little collected by entomologists, and they are expected to bring back tens of thousands of specimens. The expedition is sponsored by David Rockefeller. Dr. and Mrs. Vaurie are traveling by carryall with full camping equipment and expect to cover approximately 7500 miles.

A second expedition under the Museum's Department of Insects and Spiders is being conducted by Dr. Willis J. Gertsch, whose special purpose will be to capture specimens of the large nocturnal running spiders of the genus *Loecranoides*. Last year Dr. Gertsch ascertained that at least 20 distinct species belong in this one group, 16 of which have never been described. "One distinct advantage to collecting spiders," Dr. Gertsch

commented, "is the absence of red tape. They appear to be one animal with which people are more than willing to part."

A third expedition, led by Dr. Fredrick H. Rindge, has been exploring in western Wyoming for butterflies and moths. When last heard from, Dr. and Mrs. Rindge intended to camp about 25 miles from the nearest town and to concentrate on the moths known as the Geometridae—the winged forms of what are called "inch worms" in common parlance.

Margaret Mead Goes to Admiralty Islands

In 1928, the well-known anthropologist, Dr. Margaret Mead, made an intensive study of the children of the lagoon village of Peri on Manus Island in the Admiralties. After the passage of 25 years, she is now returning to study these children as adults. She hopes to derive conclusions concerning the effect that time, a world war, and extensive contacts with civilization have had on these people.

In line with the great development that has taken place in field techniques, Dr. Mead will have at her disposal the most modern recording instruments, the latest types of motion picture cameras, electronic flash equipment, and the like. She will be assisted by Theodore Schwartz, a student at the University of Pennsylvania, and his wife, Lenora. Mr. Schwartz will study the native languages and Mrs. Schwartz will specialize in the behavior of very young children.

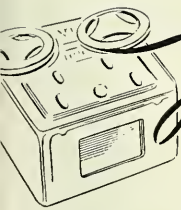
Dr. Mead expects to return to the American Museum early next year.

Back from the Bahamas

One of the finest collections of insects and reptiles ever made in the Bahamas reached the American Museum recently as a result of the six-months' expedition organized by Horace S. Van Voast, Jr., co-owner and captain of the 43-ft. auxiliary schooner "White Wing". The expedition traveled 6000 miles by schooner to all the major island groups of the Bahamas except two. Approximately 50,000 insects and spiders, several hundred of which will be new to science, and 2,700 reptiles, amphibians, and mammals were collected.

Collecting was done on foot and by bicycle, and the expedition at times enlisted the services of the natives. The members of the expedition marveled that the natives refused to handle the snakes though they were harmless, whereas they had no fear of black widow spiders and tarantulas. The scientific personnel of the expedition included a general biologist and two specialists in insects and reptiles.

Dr. Mont A. Cazier, Chairman of the Museum's Department of Insects and Spiders, stated that the specimens, together with concurrent ecological and biological observations, would make possible systematic and zoogeographical studies of the entire Bahaman area.



Hot off the Tape

Deep in Peru

Dr. Harry Tschopik, of the Anthropology Department of the American Museum, who left New York City the last of January to explore the extreme western headwaters of the Amazon River, has made good progress despite unusual floods, according to a tape recording of his experiences recently received by the Editorial Office of *NATURAL HISTORY Magazine*.

The floods were the worst that have occurred in over 30 years, and they delayed progress greatly. But they were a boon in another sense, for they made it possible to visit an isolated village of great interest, whose inhabitants embraced an artistic and moral philosophy that reminded Dr. Tschopik of the classical Greeks.

He and his companion, Raúl de los

Ríos, were traveling from the settlement of Pucallpa of the Ucayali River toward Iquitos. Their floating home was a 40-foot dugout decked over at the bow and roofed partly against the rain. Aside from the seven or eight passengers and mountains of supplies and equipment, the boat was carrying three monkeys, a marmoset, a squirrel, a turtle, and a crocodile.

"Suddenly our Indian helpers grew excited," Dr. Tschopik tells us. 'Here!' They said, 'We go in here!'

"There was nothing to show an opening at the banks of the river except water eddying around the vegetation. But we ducked in and went through the drowned jungle with big trees on each side, orchids

IN THEIR PASSION FOR BEAUTY, the Shipibos (below and right) reminded Dr. Tschopik of the classic Greeks



overhead, and parrots flying back and forth. Suddenly we emerged into a lake. It was like something invented by MGM or Paramount for Dorothy Lamour. It was the sort of village anthropologists dream about but usually never find.

"We had been traveling through the territory of the Shipibo Indians ever since leaving Pucallpa, but this was the first Shipibo community we entered, and it was certainly one of the most pleasant spots I have visited anywhere in the world.

"Thousands of egrets were flying back and forth, and great flocks of brightly colored macaws. We saw enormous communal houses, 60 feet long by 40 feet wide, scattered along the beach, each of which was occupied by a family of related Indians. As we came closer, we could see the Indians running from all directions, coming down the trail along the beach. They were watching us, seeing where we were going to land. As it happened, we landed near the chief's house and climbed out. About 300 Indians were standing around watching us."

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At this point in Dr. Tschopik's narrative, we notice a sharp departure from the procedure that anthropologists expect to follow. Usually they have to convince the natives that they wish them no harm and are there to satisfy their curiosity as to how the natives live. But here the chief came up, a marvelously dignified man, and welcomed the newcomers. Apparently before Dr. Tschopik could get a word in, the chief offered them a house and said, "I hope you will stay here for the rest of the year, because you are interesting to my people."

"They couldn't have made us more comfortable," Dr. Tschopik tells us, "except that they were so filled with curiosity. They stood around, looking at the equipment we had, examining our clothes, and watching us operate our cameras and tape recorder. They brought us presents of wild pigs, bananas, birds, plantains, wild fruit, almost anything one could think of."

"These Shipibos valued art more than they valued morals or anything else in the world. They are much more concerned with how they look than how they act, and they are beautiful Indians. Their preoccupation with beauty reminded me, in

a way, of the classic Greeks.

"They wear long bobbed bangs, which give them the appearance of sheep dogs, and they paint their foreheads black. They also paint their faces with a band from ear to ear, across the bridge of the nose, with geometric designs in red and black. They wear silver discs in their noses and lip plugs of silver or wood set through a hole in their lower lips. They also paint their hands and their feet, the women paint their legs.

"They even have something of the classic Greek forehead. They deform the head in infancy so that the forehead slopes right back from the nose. The pottery they make is almost as fine as English porcelain.

"We planned originally to spend about two hours at this village Paococho, but we stayed there for two weeks. If I had had my way about it, we would still be there. It was idyllic. The reason that we left was that the lake level started falling and if we had stayed much longer, we would have had to spend a year there."

Dr. Tschopik is continuing his explorations in the headwaters of the Amazon and expects to be thus engaged for several months.

CHRISTINE *Continued from page 305*

tains or swinging from lamps. She treated the living room table like a private jungle on which she could swing, climb, slide, and jump. She fell often and so hard that I worried at first. I would rush to her, pick her up and try to comfort her, but she wanted no sympathy, only to continue her rough play. Her head seemed as hard as a coconut, and I am sure chimp mothers don't have to worry about their babies' softspot. We had a swing and ladder arrangement under the apple tree in front of the house, and on nice days we would go outside. Christine loved her swing, and she needed no instruction on how to use it. She was remarkably sure of herself on the ropes, and the amazing strength of her muscles enabled her to do push-ups and somersaults that would be the envy of every acrobat.

She could swing and climb for hours without any sign of fatigue. Occasionally she would come down for a moment and throw her arms around me in affection, then run back to her play. I had to sit close by, though; otherwise she would not be at ease and would not touch her swing. The instant I got up, she would give a little warning cry, slide down her rope like lightning, and cling to me. It would be difficult to get away from her without her knowledge, for she seemed to sense when I was ready to leave, no matter how engrossed she was in her play. I think that this alertness is inborn and essential for the survival of little apes in the jungle.

In the beginning, she was very much afraid of everything outdoors, with the exception of the swing. She did not want her feet to touch the grass or the earth and would scream in terror if I tried to force her. As she grew older, she became more confident, but only walked on the ground if she wore a pair of knitted booties. She developed other strange "superstitions" of which I shall tell more in the next issue of NATURAL HISTORY.

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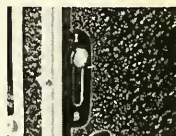
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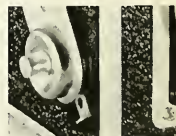


• Built-in flash synchronization, of course.



• And an aperture scale that talks: f/16, bright sun on snow or sand; f/11, bright sun; f/8, hazy sun. No guides to check; data right on the camera.

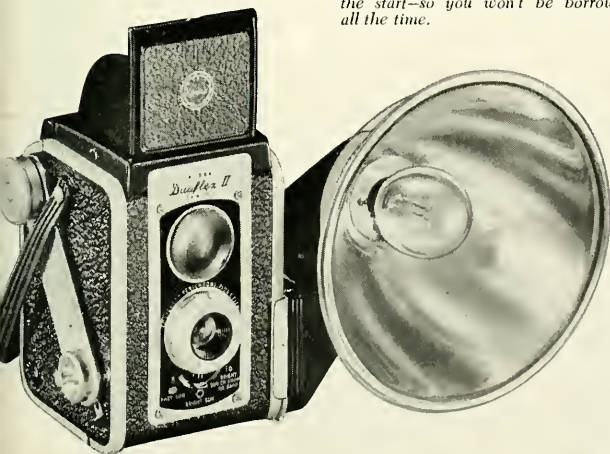
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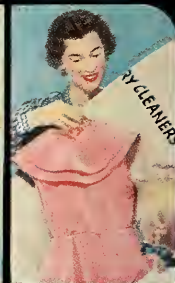


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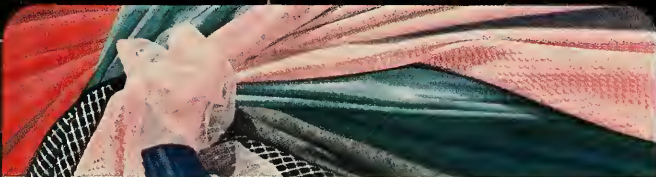
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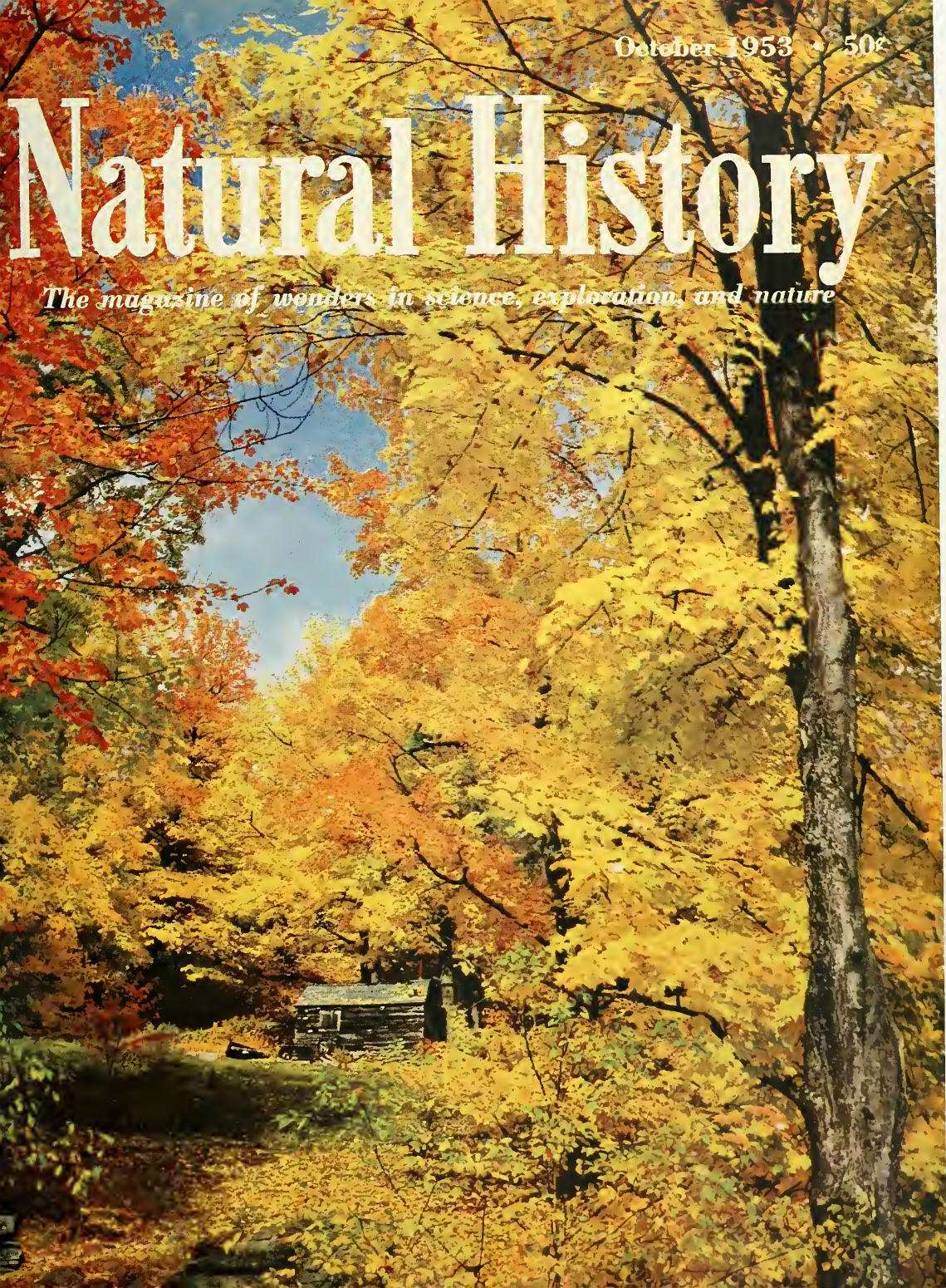


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A background study of native New Zealand art through the organization of Maori economy, society and religion. It also discusses the Maori's unique jade *hei-tikis* and other artistic expressions, particularly their facial tattooing and the custom of preserving heads after death.

MAN AND NATURE PUBLICATIONS

The American Museum of Natural History
New York 24, N. Y.



LETTERS

The Oldest Living Thing

SIRS:

I am wondering whether the statement in your January issue that the giant Sequoia is the oldest living thing is correct.

In last year's March-April issue of *Pennsylvania Forests and Waters*, there is an article on the Box Huckleberry by Albert B. Mickalitis. He calls attention to a single colony of this plant that covers an area of many acres and is believed to have originated from a single plant. "Botanists estimate," he states, "that this colony is approximately 13,000 years old, which would make it the oldest living thing in the world . . ."

Can you straighten me out on this?

THOMAS H. KNEPP

Head of Science Department

Stroudsburg High School,
Stroudsburg, Penna.

Readers of *NATURAL HISTORY Magazine* have asked about this before. And though the Box Huckleberry cannot offer anything so precise as tree rings as proof of its age, its claim is fairly well supported by interesting evidence.

It may be well first to define the conditions under which a plant or animal may be eligible to compete for the title "The Oldest Living Thing." Obviously, one does not add to the parent's age that of the child. The individual must represent one generation. Certain plants and animals sometimes reproduce without the union of male and female cells. This is called asexual reproduction. Plants capable of asexual reproduction are said to have started growing when the seed from which they sprang, having been fertilized with pollen (sexual reproduction), has sprouted and started to grow. Extension of the plant through runners or rootstocks does not interrupt the life of the original plant or make it represent a new generation of plants.

Since Dr. Edgar T. Wherry of the Botanical Laboratory of the University of Pennsylvania had a part in the investigation of the Box Huckleberry, we have induced him to comment. He writes:

"The late Dr. Frederick V. Coville, Botanist of the U. S. Department of Agriculture, engaged for some years in the effort to bring improved forms of wild blueberry into cultivation and was eminently successful in doing so. In the course of this work, he recognized that in this group of plants, self-sterility is the rule. In other words, pollen placed upon the stigmas of the same plant from which it has been gathered will not

produce seed capable of developing. Even though a plant has spread by runners or rootstocks into vast clumps, its protoplasm is still the same.

"When he investigated the only colony of Box Huckleberry known to botanists in 1930—one south of New Bloomfield, in Perry County, Pennsylvania—he found that the whole patch, spreading over some eight acres, was sterile to its own pollen throughout and therefore consisted of a single clone. A clone is an aggregate of individual organisms descended by asexual reproduction from a single sexually produced individual. Observation showed that this clump spread on the average only six inches a year. Simple arithmetical calculation revealed it must be several thousand years old.

"Another clone a few miles away, discovered by the late H. A. Ward of Harrisburg, was measured by Dr. Coville and the writer and was found to be 6500 feet long. If, as seems probable, it had started to grow at the end near the Juniata River, its age would be 13,000 years. Even if it started to grow in the middle, its age must be very great."

So much for the basic facts concerning the Box Huckleberry.

Certainly we cannot disqualify this plant just because it spreads along the ground instead of rising skyward in a single conspicuous shaft like the Sequoia. It seems rather to be a question of whether, in bringing into consideration asexual reproduction like that



Photo by Grant M. Haist

▲ A MOUNTAIN PHOTOGRAPHER records a breath-taking scene from a 12,000-foot perch in Rocky Mountain National Park, Colorado

of the Box Huckleberry, we are not opening the door to other creatures that can survive through asexual reproduction. The small freshwater animal known as the hydra, for instance, reproduces freely by budding, without the union of male and female. True, it scatters all over the place, and perhaps it has no business challenging so solid a citizen as the Box Huckleberry. We shall leave this question to the reader's judgment. But it does look as though this lowly plant has a strong claim for greater age than the 3000- or 4000-year-old Sequoia.

—Ed.

Ancient Rock Pictures in Nevada

Sins:

Several years ago some cowboys, sitting down to rest on top of a mountain in Nevada, noticed that the rock ledge was covered with Indian designs. No one in that part of the country knew about this writing, and they could find out nothing about who had done it or what it meant.

One of the cowboys told me about the find, and we made the four-hour climb to the summit. The mountain is north of Winnemucca and about 30 or 40 miles from the Oregon border. The writ-

ings cover the flat surfaces over an area of possibly 15 by 30 feet. . .

The writing seems to be drilled or pounded into the rock. In a couple of places the hack marks, as though made with a chisel-shaped instrument, are half an inch or more deep.

The markings interested me a lot, and I would certainly appreciate it if you would let me know whether they can be interpreted and whether they are worth the trouble I took to get these and many more photographs of them.

Placerville, Calif. ELMER E. JONES

The American Museum's well-known archaeologist Nels C. Nelson offers the following comments:

Mr. Jones's petroglyph site is new and can be added to the 32 already published for Nevada. Its situation on a high eminence is interesting but not remarkable, because mountain sites in many parts of the West abound in both incised petroglyphs and painted pictographs.

The designs shown here are chiefly if not entirely straight and curved line representations. In other locations there are sometimes more or less lifelike representations as well, depicting human

beings, four-footed animals, birds, snakes, centipedes, plants, etc.

Little is definitely known about the meaning of these inscriptions, and not much is likely ever to be found out. Pictorial composition showing camp sites with tepees, men and animals in action, and so on (as painted on skins by the Plains Indians or as sand paintings done by the Navajos for religious purposes) often tell their own story, as for example the life experiences of a single individual or the events of tribal history. But the aimlessly scattered animals depicted on the rocks rarely suggest any set purpose. European and other cave paintings of similar animal groupings are supposed by many to have been made in connection with magical rites to bring luck in a proposed hunt; but nothing is known of such a practice in America.

Geometric delineations are equally difficult to decipher. Some, such as zigzag lines, triangles, lozenges, and spirals, often appear on recently made pottery and basketry, but the Indian makers are not always in agreement about their meaning or they choose not to tell. The symbol may sometimes be a conventional representation of a natural object—a mountain, a cloud, a tree, etc. But the origin of the pattern is long forgotten, and the present mean-

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NATURAL HISTORY

The Magazine of the American Museum of Natural History

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October, 1953
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EDWARD M. WEYER, JR., Editor
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THE WORLD OF ROBERT FLAHERTY

by Richard Griffith

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165 pp., 74 photos

THIS is the inside story of how it came to pass that the series of popular motion pictures begun by "Nanook of the North," and including "Man of Aran," "Elephant Boy," and others was directed and produced.

Robert Flaherty spent his boyhood about mines and in the out-of-doors. His education was sporadic and incomplete with respect to formal academic circles, but he acquired a profound wisdom of the wilds through observation and his own faculties of assimilation. These early years laid the foundation for a keen appreciation of the values and interest to be found in a primitive environment, in the behavior pattern of a simple, uninhibited people, or in the observation of the fundamental basic laws of nature.

He used the documentary pattern of film recording so effectively that he established it as a valuable medium of public instruction and entertainment, and earned the title of "the father of the documentary film."

The book tells in simple narrative fashion of the travels and daily incidents connected with the filming of the Flaherty epics. A liberal use is made of the extensive diaries he kept, so there is an auto-

biographical touch to the account, a quality that gives warmth and reality to the story.

The convenient map bound into the covers shows that the reader is taken practically around the world in the Northern Hemisphere and down into the South Pacific as well. He is given an insight into all of the complications that surround the filming of a commercially successful picture and much of the detail of a specialized profession. But running all through the story is the constant play on the fundamental emotions one likes to encounter in his fellow man. It is these touches which give the Flaherty films a cosmopolitan appeal.

HAROLD E. ANTHONY

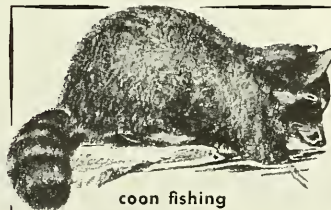
ICEBOUND SUMMER

by Sally Carrigher

Alfred A. Knopf, \$3.95

262 pp., 23 illus.

THE supposedly barren Arctic is in reality abundantly supplied with animal and bird life, particularly in the brief summer season when birds and some sea mammals return from the south. The author, Sally Carrigher, an experienced naturalist, spent three years in northern Alaska observing the yearly cycle, and one result has been this superbly written series of episodes describing the spring and summer life of the fauna. The reviewer's background is that of a casual observer of Arctic wildlife rather than a trained zoologist, but the graphic detail of the lemming migration, for example, the first



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and fifth episodes, has the appeal of authenticity.

Other chapters describe the birth and weaning of a hair seal, the adventures of a fox in his role of jackal-like satellite of a polar bear, the migration and nesting of the Pacific loon. The summer cycle of the Arctic tern is beautifully described. This remarkable bird spends the winter season in the Antarctic.

No less interesting are the episodes relating events in the lives of the Eskimo and the larger mammals, the beluga whale, the walrus, and largest of all, the humpback whale. The beginning of the fall migration of the Golden Plover is the subject of the last chapter.

Description of landscape, meteorological events, relationships between the different animals, and the narrative style tie the book together so that it reads smoothly and does not leave the impression of a collection of discrete events—rather each chapter is a part of a fairly complete picture of Arctic wildlife. The writing is for adults but the wording is simple and clear, and children will certainly enjoy it. The pen drawings by Henry B. Kane are excellent.

JAMES A. FORD

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ADAM IN OCHRE

by Colin Simpson

Frederick A. Praeger, \$5.00
221 pp., 18 illus.

NOTHING is more symptomatic of the profound change in Western man's attitude toward his less civilized contemporaries than the complete reversal one can detect in the popular accounts of the Australian aborigines. These people, long considered one of the most primitive of mankind, living on a level reduced to the barest minimum and capable of only the simplest types of mental processes, now emerge as a truly remarkable folk that has learnt to survive in one of the most rigorous environments in the world. If their culture is simple, their ceremonial and spiritual life is complex, rich, and fascinating.

Perhaps contributing to this revision of our conception of the Australian aborigines is the recent appreciation of their art. For years it was neglected and ignored except by professional students of aboriginal life. Now that Western esthetic ideas have broadened their horizons, this art has become more akin to the interests of our own artists and a more sympathetic appreciation and even respect has developed.

Mr. Colin Simpson, the author of this book, is an Australian Broadcasting Company reporter, who bases his impressions of aborigines and their life on his experiences with them in the northernmost part of the Northern Territories. He visited for professional purposes the Arnhem

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Land Expedition of 1948, which was a combined venture of the Smithsonian Institution, the National Geographic Society, and the Australian Government. With the scientists attached to the expedition, he explored the life of the natives and sub-

sequently went on to other regions in the territory to make additional recordings for his broadcasts. He tells his experiences with charm and enthusiasm and varies the pace in an interesting fashion. It is, as far as I who have never visited Arnhem Land

can judge, a good job. The reportage seems honest, with no play for special effects. And Mr. Simpson's own personality, which shines through his story is attractive.

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SEXUAL BEHAVIOR IN THE HUMAN FEMALE

By Alfred C. Kinsey, W. B. Pomeroy, C. E. Martin, and P. H. Gebhard

W. B. Saunders Company, \$8.00

Pp. vii-xxx, 3-842; 179 tables; 155 figs.

HERE is the Kinsey book at last! Never in the history of scientific publication has any book been publicized to anywhere near the same degree or been awaited by the general public with such expectation as this one. It is hard on any book to appear after such a preliminary build-up; it is particularly hard on one like this that disturbs the conventions of our society. I suspect that the authors might have preferred a more normal launching for their book but were caught in the pressures engendered by our publicity-hungry press.

The statistical results of Kinsey's interviews with diverse females on their sexual histories and behavior have already been so widely reprinted in the daily papers and magazines that it would be redundant to report again on outlets, orgasms, and onanism. Perhaps of more fundamental concern in a general appraisal of this monumental book are the following considerations.

The book has been attacked on the score of its being unrepresentative of human females in general and of the United States in particular. The sample of 5940 white nonprison females, upon which the study is based, was admittedly not a random selection from the total population but despite this, Kinsey considers it reliable within the limits of his discussion. The danger, however, lies in the possibility that these limits may not be as rigorously respected by the reader as they are by the author.

An aspect of the discussion, which now centers around the report, is deeply concerned with the justification of making such a survey available to the general public. Can such a survey of behavior be made accessible to all without affecting the behavior of the readers and those who hear of it? Kinsey himself in discussing the advantages of an interview over a questionnaire points out that in the former the inexperience of some interviewees would be respected and writes: "But a questionnaire must cover all of the activities which the most experienced adult may have had, and there would be a variety of objections to undertaking such an exposition of all the possibilities of human sexual behavior in the course of a single interview." The obvious extension of this remark is that there might be also a va-

riety of objections to exposing all the possibilities of human sexual activity to inexperienced readers as well. There is an issue here that is difficult to resolve and much could be said on both sides of the question.

It is obvious that the Kinsey report on female sexual behavior is a major publication. It raises many issues that require resolution. It should be studied with great care not only for its concrete details but for the social consequences it may encourage.

HARRY L. SHAPIRO

HOLLIES

----- by H. Harold Hume
Macmillan Co.

\$6.75, 242 pp., 73 illus. (9 in color)

AS a result of the discovery of root-inducing hormones, the vegetative propagation of American Holly is now commercially feasible, and holly has come into its own. Along with the search for better quality American Holly, interest has been awakened in other evergreen, red-berried species such as English, Chinese, and Japanese. The Holly Society of America has been formed. More is being written in our newspapers and garden periodicals concerning holly. No wonder that the publication of *Hollies* by so eminent a horticulturist as Dr. H. Harold Hume, Retired Provost and Dean Emeritus

of the College of Agriculture, University of Florida, and author of such books as *Asaleas, Kinds and Culture* and *Camellias, Kinds and Culture*, should be important. This is particularly so, since this is the first book ever written on hollies in this country and the first authoritative book to appear since W. Dallimore's *Holly, Yew and Box*, published in England in 1908 and now out of print.

For identifying English Holly varieties, Dr. Hume's 31 descriptions of varieties, 7 of them developed in America, will not replace Dallimore's 119 descriptions along with 78 leaf illustrations. Dr. Hume has dealt with hollies in America. He not only has described important varieties of the English Holly, but also the American, Chinese, and Japanese, along with other species both deciduous and evergreen. He has, with the help of splendid photographs, illustrated the various uses of holly from ground cover to specimen tree and emphasized the important fact that there is a particular holly for each landscaping purpose.

Because of Dr. Hume's easy style, *Hollies* is useful to the amateur and professional alike. His information on methods of culture, propagation, commercial holly growing, and even the future possibilities of hybridizing, are good. Anyone contemplating the acquisition of holly would be doing himself a service by first reading this book.

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Photo by Lynwood M. Choe, taken for Encyclopaedia Britannica Films, Inc.

▲ ABSORBED in the movements of the Snowshoe Rabbit, this unsuspecting Barn Owl is spied upon by the camera

Exploring THE NIGHT

While man escapes the dark in sleep or by artificial light, a host of creatures enact their dramas in the brooding corridors of night. Their secrets can be yours

By LORUS J. and MARGERY J. MILNE

University of New Hampshire

FOR almost half of everyone's life it is night. Like the green plants, which depend for energy upon sunlight, man and many creatures restrict their activities when the sun sets. Even people who enjoy learning about animals of all kinds may call a halt at nightfall. If they can't watch in the ordinary daytime way, they prefer to wait until tomorrow. Yet their eyes can follow a multitude of happenings in the night, and other senses become keener when reliance on

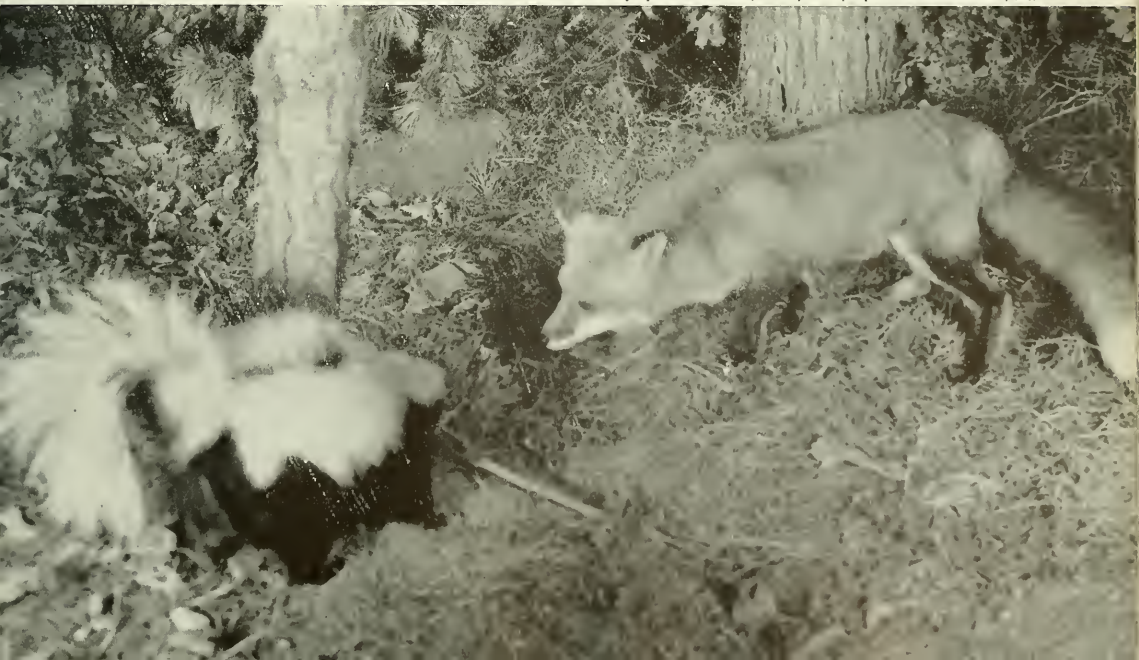
vision alone is cast aside. A whole new world remains to be explored. Thoreau pointed out that midnight is as unexplored as Central Africa to most of us.

From among the many examples of eyeshine encountered on night field trips, one pair remains outstanding as a demonstration of the limitations in human senses. We had camped at dusk in a New Mexican National Forest and were preparing supper on our gasoline stove by flashlight. Suddenly we noticed

a pair of close-set, bright orange eyes approaching. Quickly we directed the five-cell lamp at those shining orbs and saw that it was a small bear. No doubt the animal was completely dazzled by the direct beam, but it continued along what must have been a familiar path—passing between us and our tent and proceeding onward. The only evidence that it knew we were there was an occasional backward glance as it disappeared toward the small stream. No further sign of the

▼ THE SKUNK stands pat as the red fox maneuvers, trying to figure out how to capture a meal

Photo by Lynwood M. Chace, taken for Encyclopaedia Britannica Films, Inc.





L. J. and M. J. Milne photo

▲ NIGHT has no terrors for the bat. In flight, it squeaks out repeated calls, which are echoed back from obstacles or flying insects. The large ears catch the echoes and tell the bat whether to dodge or dive in pursuit

animal appeared, and we concluded that it had continued down the narrow canyon. We slept perfectly. But on emerging from the tent in the morning, we discovered to our amazement a broad, well-worn trail in the dust. It circled the four walls of our canvas house and marked where the returning bear, its curiosity aroused, had paced time and again without so much as a foot-step or a snort to awaken us.

The first night spent snug in a sleeping bag on the ground, or swaying gently in a jungle hammock between two trees, is usually a revelation—a demonstration of how much we miss by being so eye-minded. A nighttime trip afield, with frequent stops while the flashlight is turned off for half an hour or more, can provide a new adventure. You may be amazed to find that so many creatures choose the night for activity. Darkness gives many animals advantages that more than compensate for inability to see clearly.

Night is time for the timid. Nocturnal animals cannot be seen so easily by enemies nor—which seems equally important—do they face so many fearful unknowns that inhibit their urge to eat, to move, to mate. Without the sun, too, the earth radiates away its daytime heat. As temperatures drop, the relative humidity rises, and animals that are poorly protected from water-loss by evaporation can wander more safely. Higher humidity and the lack of upward air currents also

allow odors to remain in place or to be drifted gently along the ground. Under these circumstances, noses and other olfactory sense organs are far more useful. Sounds, too, travel farther in the stiller, damper air, so that hearing comes into full play. As the light fades through twilight, emphasis shifts to odors, to sounds, and, as a last resort, to touch.

Even the plants change at night. Leaves of clover and lupine, locust and pea, marigold and aster, droop as though wilted. In wetter places, jeweled weeds hang their leaves, too, but soon shows the source of its name: from notches along the edge of each leaf blade, beads of water begin to form, until the whole plant is set with glistening gems that reflect the flashlight's beam in myriad sparkling colors. Along gravelly slopes, horsetail is similarly transformed into "fairy fountains of glittering brilliants," where each joint is set with reflecting drops of water. Botanists have named this process of plant secretion "guttation." It is not dew. But no one who has admired the beauty of the transformed vegetation would choose so unpoetic a name for the miracle in his flashlighted path.

Whether our night ramble takes us along a sea beach or through a woodland, we encounter many

points of reflected light that can be identified even at a distance. Far down the path a scintillating speck may appear, moving along the ground in little rushes with pauses between. We investigate and find eyes reflecting our lamp-eyes on the head of a spider. It is a daytime acquaintance, the wolf spider—a solitary creature with a dark stripe down its back. It is still roaming the woods in search of insects on which to pounce. But our minds have leaped across the continent to deserts of Arizona and Southern California where there are other, larger spiders with reflecting eyes. As you drive along back roads at night there, your headlights are picked up and thrown back at you in the tiny glittering eyes of trapdoor spiders, which line the unpaved trails.

In the forest a golden reddish gleam may mark the resting spot of a moth on the gray trunk of a tree. On closer inspection, the sparkle becomes double—the two bulging eyes. These and the spider eyes shine like the bright buttons that are put along the highway curbing to reflect the headlight beams of each passing car. Both of these creatures have become adapted to the dark by withdrawing pigments in the eyes—exposing a reflecting layer. If we turn off

our flashlight, the gleam vanishes and the woods are really dark. With a flick of a switch we flood the moth with brilliance, and its eyes glow back at us like living embers.

This search for watching eyes, detected by their own reflection, is one of the greatest thrills of a night field trip. From the color, size, and location of the eyes—in swamp, in field, on overhanging branch—their owner can often be recognized. The bullfrog glows an opalescent green, but an alligator or caiman has an eyeshine so brilliantly ruby red as to merit the common backwoods name of "Old Fire Eyes." A whippoorwill on a branch gleams dully, but a raccoon's eyes are a bright yellow. Far more disturbing to the night naturalist is to encounter a pair of bright white or greenish eyeshines facing him from a limb above the trail—and to see illuminated by his flashlight a wildcat, an ocelot, or a puma. The eyeshine of the domestic cat is one

of the brightest known and has been familiar to man for many centuries. Indeed, it appears to have been the basis of reverence shown this animal by the ancient Egyptians, who believed that at night, when the sun was hidden from human sight, the cat's eyes continued magically to reflect it. Wild members of the cat family are not far behind in the brilliance of their eye reflections, and what these may lack in intensity they make up for in fearsomeness.

Even today there is much misunderstanding of the significance of eyeshine. Some people insist that it is light that the animal projects in the dark to illuminate its path. Actually it is merely reflected light from a layer behind the light-sensitive cells in the eye. Light entering the eye receives two opportunities to affect the sense cells—once on the way in, before hitting the reflecting layer, and once on the way out. This provision allows fuller use of the faint light

under which nocturnal animals are active and doubles the contrast between everything seen.

After becoming aware of the large number of eyes that can reflect your flashlight's beam, even the most stouthearted night naturalist may be reluctant to switch off his visual crutch and depend alone on his own unaided eyes. Often the patch of bright area seems all too small. What large animal may be approaching from the blind rear—a lynx, a puma, a herd of wild pigs, such as white-lipped peccaries with their razor-sharp fangs? Even a familiar woodland, when illuminated only by the night sky and the cyclopean beam of an electric torch, becomes peopled with grotesque shadows and suspicious, half-heard noises. The tropical jungle — so green and vacant by day — becomes a vague sea of snufflings and snortings, of crackling and dripping sounds. Your flashlight and your clumsy movements along the root-snarled, branch-littered trail must draw you to the attention of every animal within half a mile. And the sheer volume of tree trunks, overhanging limbs, and pendant vines from

▼ A DIFFICULT SUBJECT for the nighttime photographer. Startled by some foe, the hare is leaping through the deep black shadows of the forest, heading for the protection of a briar patch

Photo by Lynwood M. Chace, taken for Encyclopaedia Britannica Films, Inc.





L. J. and M. J. Milne photo

▲ DEER find their food in the night, largely by odor and taste, but their large eyes and excellent hearing keep them alert for danger from any direction

which *anything* could pounce leads to imaginings that amplify the importance of every sound.

Yet the vast majority of animals have waited until just this time to venture forth. Man, his fellow anthropoids, and the majority of birds and lizards form the chief exceptions among the vertebrates. True flies, butterflies, bees, and wasps are correspondingly unique among the invertebrates. With scattered and interesting exceptions, the rest of the land creatures are more active at night, and thereby many of them have remained relatively unfamiliar to us.

A few of these night-wandering animals carry their own lights with them. A firefly's diminutive beacon is of no value by day, but in the dark it becomes a beckoning signal for another firefly. In many kinds, both sexes have light-producing organs below the abdomen. The male flies over fields in which potential mates are perched on the tips of leaves and blades of grass. At intervals, he shines his light. If a female below signals with her glow and the timing is just right (indicating response to his flash and not just another male), he turns in flight and approaches her. A series of flashing interchanges brings him in for a landing beside her.

How the glow of the firefly is important to the insect is clear. But sources of light that are harder to account for can be found when the flashlight is extinguished and our eyes become adapted to the dark. While following a shore line under the pale illumination of the starlit sky, you may discover a brightly shining object on the sand, several inches long and definitely fishlike in shape. It is a fish but one that will never swim again. Its dead body has become covered by light-producing bacteria which draw attention to themselves en masse, although how or why is still anybody's guess. Some fungi produce a similar light and may surprise a walker in the woods. The whole interior of a soggy hollow log may shine with this "fox fire."

The use of the word "fox" in this connection has been largely forgotten. It signifies mold or decay and has no relation to the mammal seeking mice not far away.

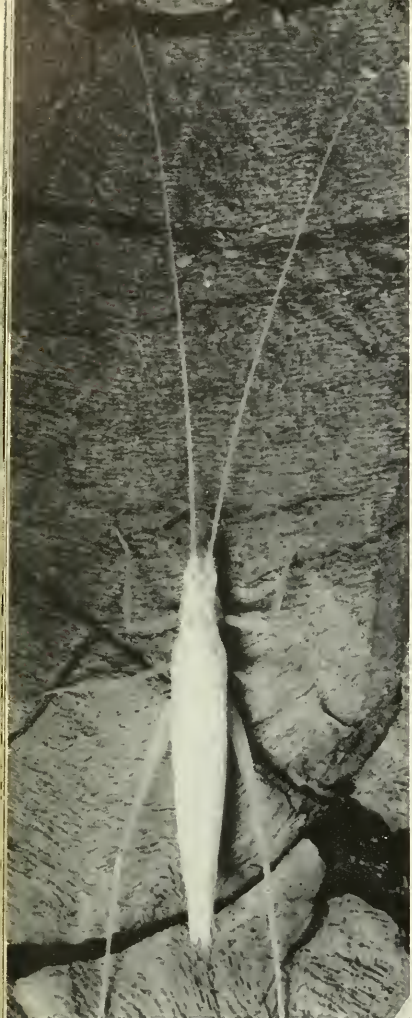
For most animals, night ends sight. Yet even without a moon, the starlit sky produces enough illumination on fields and trails in open woodland for man and many other animals to see remarkably well. The human eye that can distinguish a seventh magnitude star, or see a light of one candlepower a mile away through clear night air, can also manage to recognize detail in the night's faint landscape. The brightness may be only a billionth as great as that on a sun-drenched coral beach, but once the pupils have opened wide and the most sensitive pigments have reached full concentration in the retinas (a process requiring as much as 45 minutes), a person can see almost as well as an owl or a lynx and better than a rabbit or whippoorwill. Only animals having eyes disproportionately and actually large can gather in enough light for even vague vision where only the illumination of stars and the night sky penetrates the undergrowth. Even on the darkest nights, beasts and birds of prey, and the preyed-upon herbivores of larger size, can see well enough to make use of vision in avoiding obstacles and in finding or escaping from becoming food.

By the end of twilight, the night sky has dimmed to a low brightness that is almost a physical constant—a minimum value to be found anywhere on earth. Light scattered from the stars by the gas molecules of air produces an over-all illumination that is only a faint version of a noonday blue sky. The blueness, too, is there; but so low is the light intensity that color-sensitive eyes cannot discern any hue. A color photograph, however, when exposed for long enough to compensate for the dimness, is just as blue of sky as when shot in a fraction of a second by day. Only animals with sensitive eyes can use the night sky brightness as illumi-

nation. Among the vertebrates this means those with enough rod cells in the retina layer. And rod cells are color-blind. When a full moon has brightened the night scene as much as possible, color-sensitive cone cells begin to see. That "high held and kindly lantern" allows human eyes to discern differences between red and yellow, green and blue, that are not mere brightness variations. Otherwise all of us are color-blind at night.

Man is so dependent upon his eyes that he tends to neglect the possibilities in his other senses. And when he does call upon them to tell him of his surroundings in the dark, he has difficulty reading the languages of sounds and odors. His ears can learn quickly to distinguish an oboe from a French horn in the sonic complexity of a symphony, but it is something else again to identify the stealthy footsteps of a fox in contrast to the occasional progress of a feeding rabbit. The snap of a twig, the flutter of displaced leaves, when contrasted with intermittent sounds from crickets and katydids, frogs and toads, strain human attention to the utmost. The calls of animals in the night are so much louder that they demand disproportionate attention. Yet any change in them must be evaluated, too, if progress of a predator is to be noted in the dark. Silence may be even more informative than the sounds that came before. It was to help recognize "normal" night noises as distinct from enemy infiltration that jungle troops were trained with recordings made by Allen and Kellogg of Cornell University in the tropical forests of Panama. More recently, some of these same recordings have been presented as jungle background sounds in the American Museum of a Natural History's exhibit, "Men of the Montaña."

Often night sounds can be the voices of friends. There have been times in the north woods when we have cringed mentally from the repetitions, insistent, almost deafening cry of "Whip'-poor-will, Night'-is-here," Night'-is-here from



◀ THE FEMALE TREE CRICKET is deaf and cannot find her mate by the sound he makes. But she locates him just the same. When he "sings," he also emits a fragrance that attracts her. Sensing his presence with her long antennae she hurries to find him

▲ THE MALE TREE CRICKET announces his presence to you by the long continued note he produces by rapidly fretting together the bases of the large forewings. But when he raises his wings to make this sound, he exposes a gland near the base of the wings, which emits the aroma that attracts the female. Finding her mate, she nibbles on the gland. This photograph was taken at 3:00 A.M.

L. J. and M. J. Milne photos

a branch within arm's length of our cabin window. But more often this refrain has been a lullaby telling us more plainly than any other sound that we were surrounded by undisturbed wilderness, that the birds and beasts had accepted our presence or forgotten it for a few hours, that we might see them on errands important to them alone, in the unmolested state of nature.

Even recognizing the direction from which a continuous sound arrives requires a great deal of concentration. Frequently on a night field trip, a person can approach a bush in which a tree cricket is shrilling its high-pitched note. But

although the insect is scarcely disturbed by a searching flashlight and is more than an inch long, the greatest difficulty may be experienced in locating its slender green body on a leaf. The late Frank E. Lutz, Curator of Insects and Spiders at the American Museum of Natural History, simplified this problem of cricket-hunting by abandoning the usual way of trailing the singer. Instead of trying to face so that both ears received equal loudness of note, Dr. Lutz equipped himself with a physician's stethoscope. The cricket's song was loudest in *both* ears when the stethoscope's sensitive tip was di-

rected toward the insect. Thus human ingenuity provided a substitute for the excellent sound-collecting funnels that the cat or fox can turn toward a source of sound, or with which a deer or rabbit listens for the approach of danger.

Cricket sounds, like the calls of whippoorwill and owl, appear to be a means whereby these animals stake out their breeding grounds. Simultaneously they provide a claim to territory and a challenge to any invader of the same sex and species. Toad and frog calls, on the other hand, seem more definitely guide notes to attract any mate willing to approach. In tree

crickets, moreover, territory-claiming and mate-summoning are combined in that they occur together, yet each requires a separate mechanism. The event obvious to our ears is the shrill note, produced only by the males and heard by them through delicate ears just below the "knee" joint of their forelegs. This is the defiant half of the activity. But female tree crickets lack ears and are deaf. Still, when males raise their vibrating wings to stridulate the persistent note, these deaf mates approach as though charmed by the sound. Upon arriving, however, the reason becomes clear. Each female nibbles at a gland on the back of the male—a gland exposed when the wings are elevated into the "singing" position. His attraction lies in an odor emanating from this gland, and a highly satisfactory exudate is her reward when she reaches him. For her the woods are silent but odorous, and she merely follows the aroma, testing the night air with her long sensitive antennae.

Often it is impossible for a beginner in night field tripping to decide whether a sound is from a bird, an insect, or an amphibian. We had to meet in person many of the nighttime vocalists in Panama before we could be sure. Regularly

at the end of twilight a chorus of chirps came to us from tangled vegetation at one side of our cabin. Tenor voices mingled with soprano squeaks and bull-fiddle basses. Many of the sounds from a novelty orchestra were thrown in at intervals. Finally we investigated. Where a giant almendro tree had been felled, a stump four feet in diameter cupped a little pondful of busy toads. They perched or floated among the ax chips, and before each of them in the collected rain-water was a mountain of brownish suds—bubbles blown as the singer drew in and expelled air over its vocal chords. Not one of these amphibians was more than two inches long. Far bigger beetles patrolled the rim of their tree-stump world. But it was the bugling of the toads that drew our attention.

No night exploration is complete without seeing at least one bat, dodging obstacles and finding insects through oft-repeated bursts of sound, pitched far above the limit of human hearing. The bat cries out, its voice echoes back from some object in its path, and from the echo the bat learns what to do. The reverberations of a branch differ from those of a beetle. Skillfully the bat twists in flight to avoid the one but dives after the

other with a rapidly increased tempo of shrill calls, locating the insect with precision. We can't hear these sounds unless we record them with an instrument and bring them down to our range. A tape recorder can capture the bat's cries and then be run at lower speed to translate them into sounds audible to human ears. In the calls of the bat, 40 to 50 thousand vibrations per second are normal enough. To bring these into our audible range, they must be presented at a third this rate or less—at a frequency, in fact, that would not be suitable for the bat's need, since such lower-pitched sounds do not reflect from small objects with enough precision. The bat's flight may also be punctuated by audible squeaks, which help us in tracing its silhouette against the night sky.

In 1768, Gilbert White followed the migration of birds at night by their sounds and silhouettes. From these and other observations he concluded that "All nature is so full, that that district produces the greatest variety, which is the most examined." He could not have written more accurately had he been describing our present day — and night. Much remains to be discovered, even in the vicinity of cities and farms. The night with its characteristic animals is like another land waiting to be explored and understood.

▼ THE CAIMAN, like alligators and crocodiles, basks by day behind vertical slit pupils. At night, its eye-shine is so brilliantly ruby-red that it has won him the backwoods name of "Ole Fire Eyes"



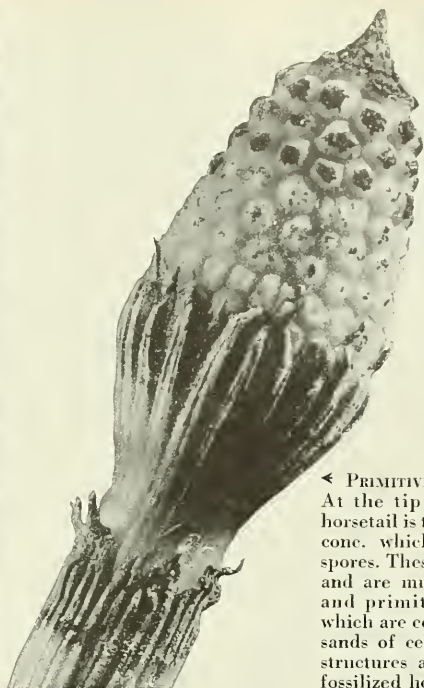


▲ **JOINTED APPEARANCE.** The ancients called them horsetails because of the branching forms of some species, but the name "joint-grass" is also current

today owing to the jointed stems. Horsetails are also known as "scouring rushes," because the silica in their stems makes them useful for scouring pots and pans



▲ LIKE its prehistoric swamp cousin, the common horsetail is often a stream-bank plant. It may reach a height of six feet as shown by the measuring stick in this photograph. But most growths average two or three feet



◀ PRIMITIVE REPRODUCTION.

At the tip of the modern horsetail is the spore-bearing cone, which gives off tiny spores. These are single cells and are much more simple and primitive than seeds, which are composed of thousands of cells. Similar cone structures are found in the fossilized horsetails

HORSETAILS

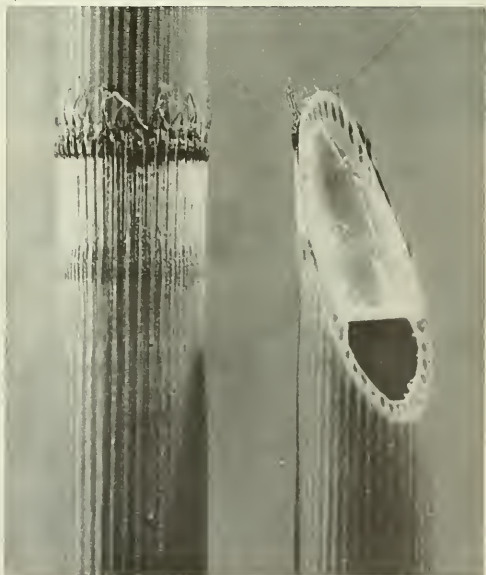
20th-century offshoots of the prehistoric past are still flourishing

A Photo Story By JOHN H. GERARD

THE living fossils known as horsetails are still growing throughout much of the world except in Australia, and most persons who pass much time out of doors are familiar with one or more of the several kinds that are widespread in the United States. The one shown here, *Equisetum hyemale*, grows also in Canada and Eurasia. Its forerunners, the Calamites, were on earth millions of years before the dinosaurs and consequently long before man. Fossil horsetails are common in coal beds and extend back to the Devonian period, over 280 million years ago.

The largest living species, *Equisetum giganteum* of tropical South America, reaches 40 feet in height but is puny in comparison with its 60-foot forerunners, the Calamites of the Palaeozoic, which exceeded one foot in diameter. Just as the giant dinosaurs did not last, these Calamites of the coal-forming days became extinct. Their little cousins pictured here are doing finely, however. Who knows but that it may survive man.

▼ SIMILAR to the prehistoric kind. The cut stem at right shows that the horsetail is hollow except for partitions at the joints. When not hollow, the ancient types had a large pith area. They were frequently strengthened by a secondary woody area inside the outer wall, which helped them to stand upright to 60-foot heights. The modern type of horsetails have no leaves, but many are profusely branched



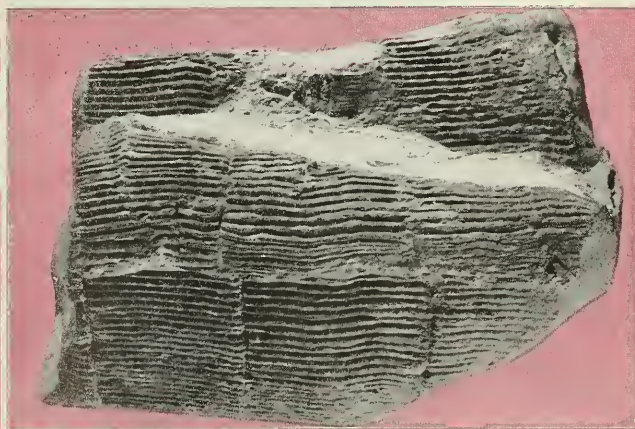


◀ THIS MODEL created by Paul Marchand in the Illinois Museummobile shows how coal-bearing sections of the country may have looked 250 million years ago. Various plants are pictured, such as *Calamites* (with jointed trunks), *Lepidodendron* (with diamond-shaped markings), and seed-bearing tree ferns. All are now extinct but were abundant in the swamp forests of those days. Dragonflies two feet long and four-inch cockroaches were common



Photo by Edwin H. Colbert

▲ ANCIENT HORSETAILS about five feet long, in position where found in Triassic rocks in Arizona



◀ THE HOLLOW stems of dead *Calamite* plants became filled with mud and sand, and these casts persisted after the actual plant structure perished. They are among the commonest of fossils from the coal period. Note how the ribs and joints are similar to those in the close-up picture of the modern horsetail. A quarter of a million rocks were laboriously split by hand by George Langford, Jr. and Sr., in obtaining fossil material of this sort from shale and sandstone layers accompanying coal near Wilmington, Illinois.

Thus, as in the case of prehistoric animals, our knowledge of the plant world of long ago is laboriously pieced together by the work of paleobotanists.



G. E. Kirkpatrick photo from *Black Star*

Does a Panther *Scream?*

Out of the night a piercing cry like the shriek of a woman
in terror. Folklore claims it's the sinister puma, but is it?

By EDGAR PERRY

WHEN I was a child in eastern Missouri, the panther had ceased to exist except in the memories of the oldest inhabitants. Even there, the image of the beast

DOES A PANTHER SCREAM?

had become confused. You sometimes heard fireside tales of fabulous black panthers that had been the scourge of the countryside. Others variously remembered the

animal as spotted, striped, long-tailed, short-tailed, with tufted ears and without.

But there was one point on which all agreed. As the creature prowled



William Finley photo from
National Audubon Society

▲ Docs can tree the panther. But when they have worn themselves out barking, he may leap over their heads and begin another leisurely run

▼ A BABY MOUNTAIN LION, gentle now perhaps but hardly a pet when it grows older

Lynwood Chace photo



the forest seeking whom or what it might devour, or lay on an overhanging branch waiting for the unwary prey to pass below, it uttered a blood-curdling scream, "for all the world like a woman in mortal terror." People who admitted never having seen a panther, alive or dead, had often heard its piercing screams at night and had been taught to shun the woods after dark.

In my early boyhood, my family migrated to northern Oklahoma. Here the panther, sometimes called cougar, had also left the scene, though more recently. He was still fresh in the minds of many. And here again, the characteristic on which everyone agreed was his fearsome, woman-like scream as he took his sinister way through the woods at night.

I was grown when I finally caught up with the beast, in the Far West. Here he had become a "mountain lion," and there were still plenty of him.

As a U. S. Forest Ranger for several years, I spent countless nights in the woods where lions were plentiful. I have seen many of them—on the ground, up trees, in traps, and in cages at zoos. But I'll have to confess that I am still listening—and with considerable anticipation—for the famous scream. Growl, yes; and hiss, spit, caterwaul, and even purr. But no scream, to date.

Here's a strange situation. This big feline—let's call him "puma," which is the name adopted by the scientific fraternity to cover the several local varieties of *Felis concolor*—was originally the most widely distributed large mammal in the Western Hemisphere. Pumas roamed the mountains, swamps, canyons, and even deserts from Canada to South America and from the Atlantic to the Pacific. Countless thousands of them have been shot, trapped, poisoned, and captured with dogs, and hardly any zoo is so small that it can't have one or more of them in captivity. Still, to this day one of the most controversial questions among out-

doorsmen is whether the animal makes any sound other than a magnified version of the ones emitted by the household tabby.

It seems certain that at least 99 and a fraction per cent of the screaming generally reported has been done by creatures other than the puma. The most common author of the hair-raising sound is doubtless the young great horned owl. Heard close at hand on a dark night, its cry is calculated to turn the most valiant blood to solid ice and the staunchest knees to quivering jelly.

Nevertheless, there does seem to be unquestionable evidence that the puma can, and on rare occasion does, emit a cry of some sort. Stanley P. Young, one of the country's most competent naturalists, who presents the pros and cons of the question in his monumental work *The Puma, Mysterious American Cat*, reports having been on hand when a specimen in a zoo uttered a cry. He quotes William Beebe, another eminent naturalist, as also having been on hand when one did.

But just to show how rare the occurrence must be, the animal Young observed was a male, whereas it had generally been understood that only the female, if either, was capable of the act. And again, Vernon Bailey, also a famous wildlife authority, while agreeing with the cry, scoffs at "scream" as a proper description of it. In some detail he spells the sound out in letters, and it is very much on the baritone side. But some smart *hombr*e made an anatomical study of the animal's larynx and decided that its structure is such as to permit only a high-pitched sound—in short, a scream.

So you pays your money and takes your choice. But whatever the scientists discover about the matter, the scream of the puma will doubtless live in folklore for all time to come. Sometimes the belief has had amusing results.

In Oklahoma I once knew a cowboy who told me of an experience he went through in his

youth. He had come out from the East and gotten a job with a large cow outfit as cook's helper during the fall roundup. It was in the rugged "Osage Nation," where pumas probably still existed at that time. The species had long been extinct where he came from, but he had heard all the old-wives' tales of the panther's propensity for leaping on the unwary. And, of course, of its awesome scream.

He made cautious inquiry about the panther situation in his new location. This was in the days before the Easterner had become sacrosanct among cowboys as a revenue-producing "Dude," and they saw to it that his concern was properly nourished. By the time he had been with the outfit a few days, about the best he could expect was an attempt on his life some night while he lay in fitful slumber.

Sure enough, one night he was awakened by an eerie cry far up on the ridge above the camp. As the hair rose on the back of his neck, the sound was repeated, closer, or so it seemed to him. With shaking hand, he dragged his pistol from beneath his pillow and prepared to sell his life as dearly as possible. Suddenly, in the glow from the embers of the dying campfire, two blazing eyes, enormous in size and indescribably sinister, took form in the darkness. He waited for nothing more. He thrust the old .44 out in that general direction and pulled the trigger.

Simultaneous with the roar of the gun there was an anguished howl. With the same presence of mind that later doubtless helped him to become one of the region's biggest cattlemen, he at once recognized the howl as the mortal cry of the cook's old black and tan hound. He hastily thrust the pistol back under his pillow and in the ensuing uproar put on a convinc-

ing show of being as bewildered as the others. The cook vowed dire vengeance on the man who had fired at his dog but was never able to pin the deed on anyone.

One thing that baffles the student of the big cat's personal habits is a quality that can only be described as reticence. Many observers have dismissed the puma as timid or even cowardly. But that does him a good deal less than justice. It is true that he shuns humans as a plague, but that is simply because he doesn't want to have any truck with them. It is pretty hard to call a creature timid if it will unhesitatingly attack another animal two or three times its size, as happens when a western mountain lion pounces on a half-grown horse or a yearling steer. It's comparable to a barnyard Tom attempting to make a meal of a 20-pound pig.

But the mountain lion wants no part of man, all the horrendous folklore notwithstanding.

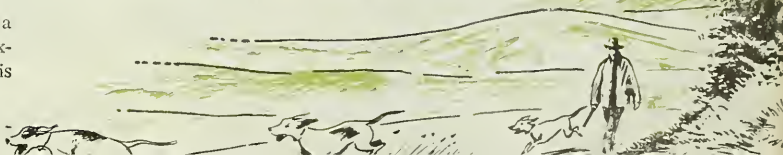
A rancher friend of mine in the mountains of northern New Mexico surprised a lion feeding on a kill in a clump of brush while he was wrangling horses one morning. He was afoot, and when the two discovered each other, they were only a few feet apart. The rancher, who was thoroughly familiar with mountain lions and their peculiarities, yelled at the beast and dashed toward him, threshing the brush with the lariat he carried in his hand—whereupon the lion hastily scrambled up the nearest pine tree!

The rancher had no gun with him, but he took off a red sweater he was wearing and tied the arms around the tree. Then he went back to the ranchhouse for a gun. When he returned a half hour later, the lion was still up the tree, distrustfully eying the sweater.

Another time, while I was on my tour of duty as a Forest Ranger in

▼ It is the combination of dogs and gunner that form the panther's only enemy

DOES A PANTHER SCREAM?



New Mexico, my assistant and I had occasion to visit a fire-lookout peak in my district. We were both newly married, and we took our brides along for the trip.

The peak had a low ledge of rock around the top, and while the assistant and I were busy above, the girls climbed down to the foot of the ledge and skirted curiously along its base. The face of the ledge was pitted with shallow caves and alcoves, and in that country any such recesses may yield artifacts of the prehistoric cliff dwellers who long ago inhabited it. So the girls were peering into every niche they could reach. They came to one that was a little above eye level, and when they stretched up by their fingertips to look in, they found it was occupied, all right—by a mountain lion! And only inches away, at that.

Whether or not lions ever scream like women, there is no doubt at all about women screaming like women, upon finding themselves nose to nose with a snarling mountain lion. The assistant and I rushed

to the edge just in time to see the big tawny cat leap gracefully out over the girls' heads and then land, running, far down the mountain-side. It's a safe bet he never thereafter chose an apartment accessible to humans.

The mountain lion has little cause to be afraid of anything that walks in North America, except man. And stripped of his weapons, man is no match for him either.

The big cats run to 200 pounds in weight and 9 feet in length, including a 3-foot tail. The one that my rancher friend treed with his sweater was one of the largest I have ever seen. It was not weighed, but its pelt, which later adorned the ranchhouse floor, was just short of nine feet long.

The creature is superbly muscled. It has the short, powerful jaws of the cat tribe in general, and is armed, fore and aft, with claws capable of ripping open either enemy or prey.

He is a wonderful hunter. He

loves venison; and if you ever get a chance to examine the evidence of one of his kills in the snow, you will agree that as a stalker, he is out of this world. You will see how stealthily he came up on the feeding deer from downwind, being careful to touch nothing that might make a noise. The print of his belly will show in the snow where he finally crouched for the spring in the last possible cover. Then an incredible bound or two, and the snow is torn up where the two bodies went down together. Sometimes the impact is so great that they go sliding through the snow for 50 feet or more.

I have never seen any evidence that a lion took a look at the size of a buck or its antler equipment and decided to let discretion be the better part of valor. On the contrary, I have seen the remains of many a lion-killed buck whose head would look extremely impressive on any sportsman's wall.

When raising horses was a com-

▼ MOUNTAIN LIONS in a typical lair in the Grand Canyon: a habitat group in the American Museum

AMNH photo





N. Y. Zoological Society photo

▲ Its swift and powerful attack sometimes sends a deer sliding through the snow for 50 feet

mon branch of western ranching, it was almost impossible to run the animals on the open range in some parts of the Rocky Mountains. If one did reach maturity, he was apt to have "lion tracks" on his haunches—the healed scars of an unsuccessful attack.

The great prowler is also fond of cattle and sheep. A yearling steer is duck soup for him, but he will attack a full-grown cow if that's the only chance for a meal. He apparently sometimes kills sheep just for fun, slaughtering dozens of them on a single foray into the frantically milling flock.

But humans, no. Oh, there are doubtless authentic cases of unprovoked attack; people have been attacked and even killed by deer and other normally inoffensive animals. But the chances of being molested by a mountain lion, day or night, are about as slim as those of being struck by a falling meteorite.

The wonder is that there are any lions left in the West, considering their depredations among the rancher's livestock and the sportsman's cherished deer. It has long

been estimated that the adult lion averages a kill a week, which does not seem unreasonable for a meat eater of his size.

Still, there are lions left, particularly in the Rocky Mountain region, despite the best efforts of state and federal hunters, livestock growers, and dude ranches offering lion hunting for sport.

This is a little hard to understand unless you are familiar with the creature's philosophy of life, which is unlike that of the much better equipped gray wolf. The gray wolf has been virtually wiped out in the region because he chose to pit his cunning against man's. The mountain lion, on the contrary, has no ambition whatever to challenge anybody. All he wants is to eat—as unobtrusively as possible—and to be left in peace. He even covers up the remains of his kill.

Many people who have ridden or tramped extensively in lion territory have never seen one—and for good reason; the lions saw them first. Even people who live on the scene commonly underestimate their numbers. It's an old story for

predatory animal control men to be told, "there are no lions left in this section," only to go ahead and catch four or five there anyway. The big but cagey cat goes to some pains to leave no more "sign" than necessary.

Unfortunately, he's a sucker for dogs, or rather for the combination of dogs and the man who follows them with a gun. He is not afraid of the dogs; and if by any chance he chooses to turn and fight them, it's just too bad for the dogs. But it's contrary to his philosophy to do any unnecessary fighting. It is less trouble to lead the dogs a chase, then climb a tree and rest while they wear themselves out in futile charging about on the ground below. When rested, he will leap out of the tree far over the dogs' heads on the downhill side and be off again for another leisurely run. I have never known dogs to catch and kill a lion on the ground.

The only trouble is that while the lion is resting up the tree, the man with the gun arrives on the scene—and it's all over for the lion.

Maybe in time he'll learn to jump before the man gets in range. I can't help hoping that he will, even though he never screams for me!

Assignment

Amazon

First glimpses of a group of Chavante Indians—a tribe whose name has been a symbol of treachery and cruelty through the centuries

By EDWARD WEYER, JR.

Editor, NATURAL HISTORY Magazine

All photographs by the author

THE airliner was dodging thunderheads as we approached the mouth of the Amazon at three in the morning. I wondered whether we could get down through the clouds to make the scheduled refueling at Belém. I also wondered whether a certain man, who I think might prefer to remain unnamed, would be there. Two days ago I had learned that he was tossing in bed, fighting his fifth attack of malaria. The plane would stop for only 45 minutes.

This man was my only friend in South America, and I had never even seen him. I was counting on his special information to save from failure the most exciting mission I had ever undertaken.

A tropical torrent slashed against our wings like hail, and the plane shook. Lightning flashed round about, but our motors, still screaming like demons, drowned the sound of the thunder. Now the sign was flashing, telling us to strap ourselves to our seats. We dived

into the clouds, and a huge arrow in red and green lights appeared out of nowhere. We were coming in for the landing.

Through the mists at 3 A.M., the airport buildings at Belém seem to be lighted by ectoplasm. And when you step from the pressurized cabin, the river and the jungle enter your lungs. You walk on air-legs toward the big glassed-in restaurant, which rocks like a friendly ship at anchor, dim-lit in a sea of aromatic forest.

Through the windows I could see that there were only two persons in the big room—a woman sitting over a cup of coffee and a wiry man pacing up and down with a short pipe clenched between his teeth. The next moment, a Brazilian official called my name and hurried me to the immigration gate. I knew then that my friend had gotten out of bed and came to the airport.

Four months had passed since I had first sought his help in track-

ing down a man named Orlando Vilas Boas, who was somewhere in the jungle about 10000 miles from Belém, near the center of South America. Orlando Vilas Boas was not lost, but he had a story that had never been told, and I wanted to get it for the readers of NATURAL HISTORY Magazine.

I had first heard of Vilas Boas at the Explorers Club in New York. Travelers returning from the Brazilian state of Mato Grosso—the “Thick Forest”—told of his courage in exploring unknown regions and his success in bringing peace among tribes formerly counted among the most dangerous in South America.

I had raised enough money from

➤ RADIO STATION at Chavantina, frontier settlement on the border of Chavante country. It was necessary to establish peaceful relations with the traditionally hostile Chavantes when the Foundation for the Development of Central Brazil undertook to lay down a shorter air route between North and South America. The Chavantes stood in the path of the projected air fields





▲ BEGINNING TO KNOW the ways of the white man but still living on his own side of the river: a Chavante, whose people have earned a reputation as one of the most warlike tribes of South America



▲ A SEMIWILD Chavante mother and child in a village 15 or 20 miles inland on the other side of the Rio das Mortes from Chavantina. Many Brazilians lost their lives before the Chavantes to the north of Chavantina came into peaceful relations



▲ A YOUNG CHAVANTE, whose life will see many changes over the primitive traditions of his parents: a boy whose village is 15 or 20 miles from the progressive frontier settlement of Chavantina



◀ A FLIGHT up the Rio das Mortes to a wilderness outpost in Chavante territory: the Assistant Padre of Chavantina emerging from the plane that carried the author on this flight

outside sources to make the trip.* Because I am an anthropologist by training and the American Museum did not have any material from this region, Dr. Harry L. Shapiro, Chairman of the Anthropology Department, kindly made available enough money to buy trade goods with which to make an ethnographic collection.

When in December I wrote to my friend about my plan, he fanned the fires of my curiosity by replying, "There are difficulties. You will have to meet Vilas Boas through an accident." During the following four months, I wrote no less than 26 letters to various Brazilian officials, but up to the moment of my departure I had not received an answer to a single one.

*Expenses of the expedition were partially sustained by a grant from the Vose Exploration Fund of the Explorers Club.

Orlando Vilas Boas spoke only Portuguese and Indian tongues, so I had had to take private tutoring in Portuguese at the Berlitz School, learning a language just to talk to one man for several hours.

I had never traveled in the tropics, but my interest has always been in primitive people, and I had long wanted to visit the Amazon Basin. But when, after four months of effort, I boarded the plane in New York with a jungle hammock, a canoe paddle, and a bow and arrow, I was really no closer to getting there than I had been at the start.

My wife, Susie, says she will always imagine my friend in Belém wearing a black raincoat and carrying a miner's lantern. The effect was not very different. I hurried into the waiting room.

"There is not much time," he said, presenting me to his wife. "Do you want to eat?"

"I would rather listen than eat," I said.

"That is good." He drew his chair closer. "You are trying to enter a region that is carefully guarded against exploitation. The approach

must be made through the right governmental channels. That is not easy in any country. To get to the region where Orlando Vilas Boas' authority is recognized, you will have to pass through territory that is under a different governmental administration. The two do not see eye to eye."

"I came to Brazil to learn something," I said, "not to tell people how they should do things."

"Precisely," he responded. "Keep your own council and learn to be patient. Have you a hotel reservation in Rio? No?"

He handed me a copy of a telegram he had sent, reserving a room for me in his hotel. A second wire he thrust into my hand asked the President of Panair of Brazil to assist the visiting scientist. A third informed Dr. José Malcher, Director of the Indian Protection Service, of my arrival and asked him to help me in the plans he had already described in his letters. I was overwhelmed and said so.

As the men outside pumped the plane full of gasoline, my friend pumped me full of names and advice.



▲ THE RESIDENCE of Teofilo Prates Reis, a remarkable frontiersman who lives with other members of his family here in Chavante territory. Wilderness lies on all sides of his hut, yet the courtesies of civilized living had been retained. The man of the house handed the author a beautifully engraved visiting card, on which the location was designated: "Araes, Mato Grosso." This hut and a few out-buildings are all there are to Araes

➤ INSIDE THE HUT shared with his mother and brother, Teofilo (right) enlarges his Chavante word list. The Assistant Padre from Chavantina also takes the opportunity to extend his vocabulary. The friendly young Chavante shown here is one of their few sources of information



His manner was swift, exact. His wife nodded and smiled at mention of a helpful friend or looked troubled when he spoke of difficulties that might defeat my plans.

He had timed everything to the minute. When shortly a bell rang, telling us it was time to reboard the plane, he had given me a complete blueprint of operations. He had one more thing to say as we walked toward the gate.

"Find a man named Colonel Eggeling in Rio. I can't give you his address. But find him if you can. He is a medical doctor and a good man."

The bell jangled again as we exchanged handshakes.

A moment later I was in the plane looking out through the port-hole. There was the glass-enclosed restaurant where we had sat, but it was empty. The ghostly scene remained unchanged, but the ghosts of my friend and his wife had vanished. I could hardly believe I had seen them in the flesh.

To get from Rio de Janeiro to the rivers that form the Xingu (pronounced Shing-GOO), which are near the very center of the conti-

nent, the traveler has the choice of two ways. He can either persuade the Brazilian Government to fly him in and put him down in a clearing, or he can go on his hands and knees. As soon as I began the round of visits to government offices, I knew that my friend's advice had been excellent. Even so, it was going to take time, because in addition to the transportation, I had to secure permission to make a scientific expedition, to take photographs, and to make a collection. I almost wore out one pair of shoes before getting off the sidewalks of Rio. But I liked the Brazilian people from the start and felt a great zest for the adventure ahead. I sure did want to see those "stone age" Indians in the interior.

I found Colonel Eggeling by a method I understand has proved

useful to the FBI. I looked him up in the telephone book and was talking to him two minutes later. As a medical officer in the U. S. Air Force, he was serving on a special mission in Brazil. The help that Colonel Eggeling gave me and the hospitality that he and Mrs. Eggeling showed during my stay in Rio leave me lastingly grateful to them. In a matter of hours, he had a place for me on a C-47 that was flying to Chavantina, but my baggage was too heavy, and I had to wait for the next plane. Even then, I would have to cut down my gear about one-third. I decided to leave in Rio about half my dehydrated foods and trade goods. The most important items to keep were a machete, cooking equipment, emergency fishing gear, and rubber boots, plus



▲ ONE OF THE TWO wild Chavantes who drifted into Chavantina shortly after the author's arrival. Neither had had previous contact with civilization. The lip ornamentation had been painted on and gradually wore off, because the Indian had not brought his cosmetic equipment with him

the hammock, canoe paddle, and bow and arrow. I knew nothing about how to use the latter, but it might prove useful in an emergency, and the Indians might like it. With this stuff, I could remain about a month in the interior.

In Rio I was often asked two questions: With whom are you going? and what firearms are you carrying? I could not afford an assistant, and since I carried no firearms, some arguments arose. I stood my ground on what I thought was the simplest sort of reasoning. I would have to go to sleep every night, and a gun would do me no good then. In fact, it might only be an added incentive for hitting me over the head.

So it was with the equipment I mention, plus a wonderful letter of endorsement from the Director of the National Museum of Brazil, Dona Heloisa Alberto Torres, that I made my way through the dark streets of Rio early one morning to the airport and took off for Chavantina.

We came down at the town of Aragarças amid clouds of grass-

hoppers and passed the night there. Early the next morning, I got up and hurried to the field to see my plane flying off with my baggage in it! Officials reassured me that it was only making a side trip and would be back. Around noon, it took us on to Chavantina.

Chavantina is named after the Chavante Indians, who have long been known for their ferocity. Their territory, about the size of New Jersey, begins just across the Rio das Mortes from here.

Probably the two most notorious tribes in South America are the Chavantes and the Motilones. The Motilones, in western Venezuela, have for decades killed those who tried to enter their territory. One of the oil companies ran into so much trouble that they pretty much gave up hope of exploring the area. When the American Museum became interested in trying to get a Motilone collection, the man they chose for the job stayed down there for eight months. The only Motilone object he brought back was an arrow they had shot into his boat.

The Chavantes came into the picture when Brazil decided to lay down a shorter air route between North and South America. The hostile Chavantes stood squarely in the path, for the Great Diagonal, as it came to be called, struck

straight across the jungles of the Amazon Basin from Rio de Janeiro to Caracas, Venezuela, and thence to Miami, Florida. The customary route around the bulge of Brazil or by way of Belém took hours longer. But, before the Great Diagonal could be used by commercial planes, a series of emergency landing fields would have to be established at strategic intervals. So the Chavantes had to be pacified.

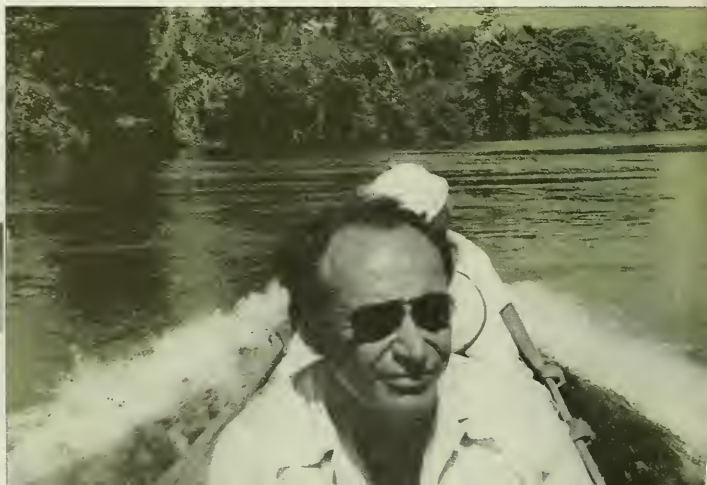
As much as three centuries ago, a band of adventurers in search of gold or diamonds reached the banks of the then unknown Rio das Mortes and attempted to cross it. The Chavantes defeated them, and there was great slaughter. The river is said to have flowed red with blood two days and was named the River of Death. Down through the centuries, no one succeeded in challenging the independence of the Chavantes, and their name became a symbol of treachery and brutality.

In more recent years, many explorers have lost their lives trying to enter the Chavantes' territory or the headwaters of the northward flowing Xingu River to the west. Most of them passed through the scene without leaving a ripple on the pages of history. All of the fame has been heaped upon one man—Colonel Percy Fawcett. We should

▼ DR. OLIVIO DE SOUZA, Chief of the Post of Chavantina, traveling upstream by dugout on the Rio das Mortes to meet and trade with Chavantes who had not had contact with civilization



▲ FATHER ANTONIO COLBACHINI, veteran Salesian missionary, who participated in the journey

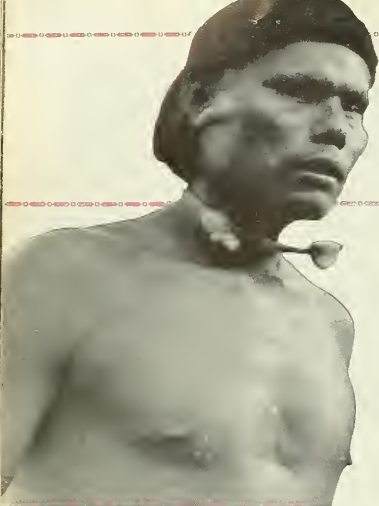




▲ THE CHIEF at first stood between warriors holding bows and arrows, and the atmosphere was one of tense caution. He is wearing a string of colored beads just given him by the author

not be surprised. If we but glance at history, we see that the imagination of the public has been captured by the explorers who searched for something that wasn't there. Explorers with sober, scientific objectives have passed through the headwaters of the Rio das Mortes and the Xingu without anyone being the wiser. But Colonel Favcett, who was searching for a fabulous city of great wealth in a range of nonexistent mountains, has become known throughout the civilized world. In 1925, in company with his son, Jack, and Raleigh Rimmel, he approached this region from the southwest, and none of the three ever came out alive. They were murdered by In-

▲ SOME OF THE WILD CHAVANTES helped the party unload their dugout



▲ TENSENESS characterized the mood of the Chavantes throughout

➤ ONE OF THE WILD CHAVANTES with the son of a Chavante chief from downstream who accompanied the party

"STONE AGE" natives of Mato Grosso, whose long history of hostility left little room for pleasantries during this meeting. The resistance of the Chavantes to overtures from the white man results chiefly from their determination to protect their hunting grounds and a reluctance to end the ancient feud until fully convinced of the white man's good intentions. The meeting was sober but amicable



dians, probably near the western border of the Chavante country.

In the early thirties, two priests started out on the Rio das Mortes to Christianize the Chavantes. Their remains were found in the river, mutilated by clubs. They were holding their crucifixes, and their hands had been shot with arrows.

Through the inspiration of General Candido Rondon, one of the great humanitarians of our day, the Brazilians have distinguished themselves among the nations by their treatment of their aboriginal people. General Rondon was the third person ever to receive the Medal of the Explorers' Club. When I was in Rio, I had the pleasure of meeting him and telling him that he is the only living person whose bust stands in the American Museum of Natural History.

In earlier centuries, Brazil's attitude toward its Indians was not very different from our own, in which men went out to hunt the weakly-armed Indians, exactly as they would animals. General Rondon realized that the Indians and their culture would be destroyed

unless the use of firearms against them was outlawed, regardless of the provocation. Through his efforts, it has become the law of Brazil, "Die if you must, but never shoot an Indian."

One of the most shocking incidents occurred in 1941, when Dr. Genésio Pimentel Barbosa, working for the Indian Protection Service, tried to establish peace with the Chavantes northeast of Chavantina. From São Domingo, a post about 100 miles north of Chavantina, he led his men into Chavante territory. Making a shelter for his five civilized companions and himself, he sent his three Indians ahead to invite the Chavantes to come and receive his gifts.

The Indian emissaries hid themselves near the Chavante encampment to make sure that their Sherente dialect would be understood. Assured, they approached and gave their invitation. The Chavantes spoke not one word in answer. Upon returning to Barbosa, they were directed to try again. They did so, but came back with the same report.

While they were gone the third

time, about 300 Chavantes attacked Barbosa and his companions. Marks of machete blades on the war clubs left by the Indians showed that there was a struggle. But Barbosa's guns were not moved from the box in which they lay near by. All six men were massacred and their remains scattered about the clearing. For about a month, some 200 Chavantes camped close to the riverbank, ready to murder anyone who tried to return. It was not possible to recover the bodies for six months.

To Francisco Meireles perhaps more than anyone else should go the credit for pacifying the northern Chavantes. In 1945, with 10 helpers, he made his first penetration into Chavante country. He prepared four spots at varying distances from the river at which to leave presents. At first, the presents remained untouched. After about six months, they began to disappear. In April of 1946, while workmen were building a hut at a place called Roça, metal tools that they were using disappeared. On one occasion, at the station nearest the river, arrows were received from

the Chavantes in exchange for gifts, and on the last day of July, when Meireles went to Roça, he met three Chavantes. This was the first official contact with the people.

One week later, at the beginning of August, he went in from the river again, and on the second day, his muleteers, while searching for lost animals, sighted Indians. Continuing to the place where Barbosa had been murdered, Meireles found paths that the Chavantes had made for use in case of a hasty retreat. He left presents and withdrew to eat lunch. By the time he and his men returned, the presents had disappeared. Meireles then discovered three arrows with broken points, left as a sign of peace. When he and his men called out, about 10 Indians appeared.

This number quickly swelled to about 20, and Meireles began to hand out his presents. But the number of Chavantes continued to grow, and signs of unfriendliness were noted. Meireles made a fire, hoping to summon assistance. The presents ran out, and the Indians were so angry that he ordered the horses saddled for a quick withdrawal. The circle of Indians had closed around them.

Lincoln de Souza gives a dramatic account of this event in his recent book, *Entre os Xavantes do Roncador*.^{*} The operation was concluded amid obvious hostility. The men got on their horses and fled with the arrows of the Chavantes raining around them. One of the men was hit, and so was a horse. Another horse became separated and was lost.

Various other attempts were made to woo the Chavantes, but it was not until May 29, 1947, at São Domingo, that someone cried, "Look at the Chavantes!" The Indians had gathered in great numbers directly across from the post at which Meireles had worked so long. When he courageously crossed the river and stepped ashore, the Chavante chief, Apoená, threw his arms around him and wept.

Kindness had won out. The chief whose people had murdered Barbosa and many others could not continue the one-sided fight. His body shook in paroxysms as he wept on the shoulder of his civilized brother.

There is much we cannot pretend to know about the psychology of primitive people. Was his emotion simply caused by his relief from years of fear? We must then call it a curious display of joy. Or had the frightful brutality practiced by Apoená and his people somehow shamed the inner spirit even of one so cruel as this son of nature? We think that we grieve when we lose a friend, yet here Apoená had gained one. Perhaps grief is mostly disappointment in oneself, and joy the release from painful memories. When General Rondon heard of the truce, he wired Meireles, "This is a victory of patience, suffering, and love."

Less had been done about the southern Chavantes, for the Great Diagonal by-passed them, and it had not been my purpose to go looking for them. My aim was to find and interview Orlando Vilas Boas, farther toward the interior, but I couldn't get a plane to take me. And soon after my arrival at Chavantina, Brazilian officials were planning to have me meet Chavantes who had never met anybody.

As a foretaste, Dr. Archimedes Pereira Lima, President of the Foundation for the Development of Central Brazil, who had arrived the day before in his official plane, took me 15 or 20 miles inland across the river to a semiwild village of Chavantes. It was a memorable experience to see the completely naked men and women streaming out of the thatched huts at our approach. But my real encounter with the Chavantes lay ahead, and I must hurry on. Nor can I adequately thank Dr. Archimedes and the other officials in his efficient developmental agency for the many opportunities and facilities they offered me during the time I was their guest here and farther in.

Fortune favored me, for shortly after my first view of the Rio das Mortes, two completely wild Chavantes who had had no previous contact with civilization drifted into the post. As Teófilo, our trusted boatman, said of the extraordinary events that followed, "The Brazilian authorities had tried for eight years to establish contact with the group from which these two came; yet in less than eight days you met and traded with them."

An anthropologist rarely has a chance today to observe the habits and manners of primitive people who have never before had contact with civilization. I followed these two wild Indians around, fascinated by everything they did and enthralled by the new view I got of our own world through their prehistoric eyes.

The second day, they grew impatient to return to their people, somewhere in the tangled wilderness up the Rio das Mortes—over there where today is a distant yesterday and where the wild tribesmen are living much as our ancestors must have 10,000 or 20,000 years ago.

I don't know whether the reader will understand how I longed to share their journey back to that prehistoric scene. Evidently they were traveling to an encampment about eight hours up the river by dugout, less if an outboard motor could be used. I felt quite impatient when no one seemed to pay attention to my remark, "How can you let them go without following them?"

But that evening, Dr. Olivio de Souza, head of the post, sent me word that an effort would be made to contact the group the next day if I were willing. The first half of the journey would be made by plane, the second half by dugout.

Was I willing! The first try failed halfway because the dugout did not materialize. I suggested that we might undertake the whole trip by boat, and we did, starting the next day at dawn. In addition to the two wild Chavantes, we had with us the son of the Chavante

^{*}Published by The Ministry of Documentation and Health, Service of Documentation, Rio de Janeiro, 1952.

chief from the semiwild village, whose group was actually hostile toward the others. Dr. Olivio and Father Colbacchini, a veteran Salesian missionary, had positions in the bow of the dugout.

The river is broad and beautiful, though swift in spots, with four or five rapids in the stretch we navigated. This was my first trip in a dugout, but I had grown up in a canoe and enjoyed every minute of it. Our boat was heavily loaded and loggy, and we took in water through cracks near the gunwales whenever we weren't on an even keel. One outboard konked out, but we had brought a substitute.

Brightly colored macaws flashed out of the tree tops as we passed, and occasionally an alligator disappeared near the bank. My reveries were broken at one point when a four-inch spider, which had stowed away in our baggage, tried to climb up inside my trouser leg. I got him overboard after a few gymnastics, and my companions seemed rewarded by the performance.

The sunlight became dazzling in time, and I rested my eyes by stringing colored beads I had brought along as trade goods.

In the afternoon, our wild Chavantes showed that we were nearing their encampment. Rounding a bend, their motions told us that the place where we should land lay directly ahead. We nosed the dugout into the bank, and presently we found ourselves in a small clearing surrounded by 10 or 12 of the most serious looking wild men I have ever seen. They carried bows and arrows, and their serious expressions showed they were anxious to know what business we were up to. They had been cooking their meat on a tripod five feet high with three sticks lashed halfway up to form a platform.

My great curiosity at this point was to find out if we could establish any understanding with these people or decipher their moods and meanings from their expressions and gestures without the use of words. Their lives had evolved

along a totally separate line from ours for many thousands of years. Would we know whether they were "wagging their tails in friendship like a dog or twitching them in anger like a cat?" The handshake, of course, would be useless. And I had learned a lesson at the other Chavante village. Seeking to express my affection for one of the Chavantes, I had patted my own heart and then his. He drew back with a start, glowering at me, clearly afraid that I was putting a spell on him. Hasty and earnest patting on the shoulder fortunately convinced him that I simply didn't know good manners. I was going to try not to let anything like that happen here, and the shoulder-patting began.

There was something very strange about the appearance of these men, but I could not put my finger on it. Their black bangs were cut straight across the forehead and back over the ears, behind which the hair hung loosely down the back. Through holes in their ear lobes they wore smooth sticks, looking like 5-inch sections of round, straw-colored lead pencils. Around the neck, each had a length of rope, simply wound around itself once in front with the fluffy ends sticking out at the sides. One man had an open crisscross of scratches on his chest. Their teeth were strong and clean, their bodies muscular and well proportioned. But it was some minutes before I could discover what made them look so very peculiar. None of them had any eyebrows! Sparse chin whiskers, yes; and more body hair than one sees on many Brazilian Indians. But eyebrows? None. Apparently they plucked them.

There were no women. The men had left them some distance back in the jungle so that in case of a skirmish they would be at a safe distance.

As we went up to each of these warriors and smilingly exchanged shoulder pats, they uttered explosive greetings. For a few moments, they made the clearing resound with the word, "Owww-Way!" But

when I returned this salutation, I sensed it might not be proper for visitors to use it. Perhaps it meant "Welcome!" and sounded as though we were welcoming them to their own land. But I was greatly gratified to get a fleeting smile from every Chavante I approached.

Without delay, I set up my recording apparatus, and it was a good thing I did. The tape recording I made promises to have peculiar value. It preserves the conversation between our Chavante and the chief, and the Brazilian authorities are anxious to learn what these people think of the white man. The Chavante talk sounded more like a series of clicks, hiccups, and gasps, but it can probably be translated by language experts. If so, it may determine the next move in this frontier area.

I am stirred by Brazil's "Die if you must, but never shoot an Indian." But quite frankly, I was not looking for a chance to demonstrate it. Our semiwild Chavante, who was said to be hostile toward the other group, was carrying a rifle, and I was not sure how well he had been indoctrinated. People have turned and walked away from Chavantes only to become converted into living pincushions. To make my attitude clear to the reader, I was quite willing to be looked upon simply as the sound technician, open to offers from whichever group came out on top. I scarcely had time to realize I might not be able to name my own terms. I was very busy taking movies and stills and changing films.

Dr. Olivio interrupted my camera work to say that I should show my trade goods to the chief. By no stretch of the imagination could you say that a holiday spirit now prevailed. The faces around us, as I believe you will agree from the photographs accompanying this article, showed that the Chavantes were concerned with more serious matters than how many bows and arrows they would have to give up to procure a mirror for the girl back home. Through the lengthening shadows, which added a somber

atmosphere to the scene, I could see that there wasn't a smile in the lot. But I was proud of my trade goods, and I swung into my act as cheerfully as any drummer.

Within the first minute, I had given myself a good opportunity to learn whether Chavante arrows are poisoned. I accidentally jabbed one of the needle-sharp points into my hand. I had no first aid kit here, but I remembered that my pocket snakebite outfit had a little bottle of antiseptic. I stopped the blood with my handkerchief and applied the antiseptic. Happily the wound healed without any trouble.

The trading was done entirely through the Chief, who was one degree more austere than the others. I had counted on fishhooks being a fast-moving item, but these people apparently didn't even know what they were. I was satisfied, though, with what I got: bows, arrows, neck ornaments,

whistles, and various other objects.

When I had finished, I was dismayed to see all of my people disappearing down the trail toward the river. Who is it who said, "Leave them laughing when you say good-bye?" Something told me that it was a time for that motto, as I hurriedly gathered my things together. So, before turning my back upon the Chavantes, I went the rounds: pat-pat, smile, pat-pat. I was 30 feet down the trail when I realized that I had left my most valuable camera on the ground!

How I loved that camera! But how smooth and easy the trail ahead of me looked! It was not an easy decision. The rest of my journey would be almost useless without it. In the end I counted upon the Chavantes having a sense of humor. Measuring the distance between the Chavantes and the cameras, I said, "Oh-oh!" and high-stepped it back into the clearing

in a pantomime of exaggerated caution. As I picked up the camera, I glanced sidewise at their faces, and I knew then that a smile is a smile or, as Gertrude Stein might say, is a smile. They got the point and were grinning.

Burdened with my equipment and trophies, I plodded down the trail toward the river. Over my shoulder, a curtain of leaves closed upon a scene from the Stone Age.

Seated once more in the dugout, I suddenly realized that I had not eaten anything except a cup of coffee and a bowl of soup since 3 o'clock the afternoon before. But what I was really wondering was what those people out of the past would have done if I had told them I wanted to go and live with them for a while.

Dr. Weyer will recount further adventures in his efforts to contact Orlando Vilas Boas in the interior of South America in the next issue of NATURAL HISTORY Magazine.

A Chavante Village with *Mysterious "Mushrooms"*

Strange objects challenge curiosity in a native community
photographed from the air deep in forbidden territory



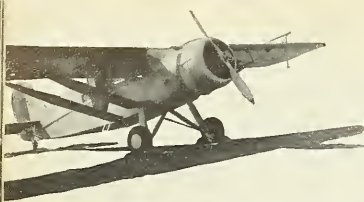
EDWARD WEYER, JR.

Editor, NATURAL HISTORY Magazine

All photographs by the author

LOOKING for Indian villages from the air in Brazil is a little like studying the "canals" of Mars, particularly over Chavante country where it is wise to keep at a safe height to avoid the arrows of the natives. Two days after trading with the wild Chavantes described in the foregoing article, I had the good fortune to fly over and photo-

◀ A REMARKABLY SYMMETRICAL CHAVANTE VILLAGE, large enough to enclose a fair-sized football stadium. Its 23 huts, about 30 feet in diameter, probably shelter several hundred inhabitants. Note the curiously-shaped objects that form the inner circle



▲ PLANE used in photographic flight over Chavante village

graph this village. Certain features in it are unexplainable.

In a plane kindly put at my disposal by Dr. Olivio de Souza of the Foundation for the Development of Central Brazil, I was flown in a westerly direction for about 57 miles. Approaching the village, I was astonished at its perfectly circular shape and its size. Considering that the Chavantes pass much of their time scouring the wilderness for game and that they have been assumed to be a very primitive group, such geometrical precision was indeed surprising.

Either by pacing off the distance from a center point to each hut or by describing a circle with a length of cord such as they are known to make in considerable quantity for their bowstrings, they have laid out their community in an almost perfect circle. The slight break in the curve only strengthens the belief that the "city-planners" used some mechanical means. The village may well have resulted from the joining

of two clans, because eight months earlier, Dr. Olivio de Souza had sighted only 8 huts, where there are now 23. Possibly these were the first eight to the right of the break. It looks as though a slightly different radius had been used in laying out the rest of the curve.

Measured by the height of the human figures, the village has a diameter of about 730 feet. The 23 huts are about 30 feet in diameter and might hold from 15 to 25 persons each. Thus, the population of the village may be between 345 and 575 persons.

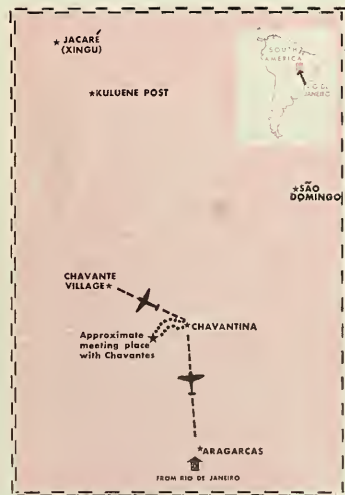
There seems to be one main center and two secondary centers. Each of these has a small circle, which might have been made by the feet of dancers. This explanation is suggested by a dance performed by the wild Chavantes I met west of Chavantina near the Rio das Mortes. These Indians put their arms around each other to form a circle and then while chanting danced around on the same spot.

One of the most spectacular features of the village was a long avenue, or *estrada* as my Brazilian friends called it, leading out from

the center for about a mile. I half expected to see at the end of it something of importance, perhaps of a religious nature, but the avenue simply disappeared into the jungle.

Most perplexing of all were the mushroom-shaped or treelike objects in front of the huts. Their peculiar form was not fully evident until enlargements of the photographs were made in New York. But in the plane I had been startled by them, and I asked my Brazilian friends what they thought they were. They believed them to be household furnishings, possibly cooking equipment, racks for weapons, or the like. As these enlargements show, however, the single stalk that supports each is the peculiarity that distinguishes them from the usual type of drying rack or food cache that is common in primitive communities. The top seems in some instances to be flat, in others to be a sort of globe-shaped mass. There is often a dark center.

Perhaps these photographs, which are published in *NATURAL HISTORY* for the first time, will enable someone to hit upon the correct explanation.



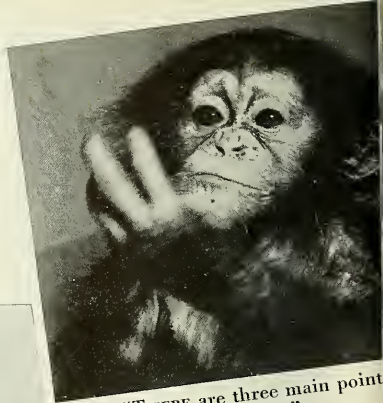


◀ THIS HIGHLY ENLARGED PHOTOGRAPH shows that the mushroom-shaped objects are four to five feet high. Each has a black center

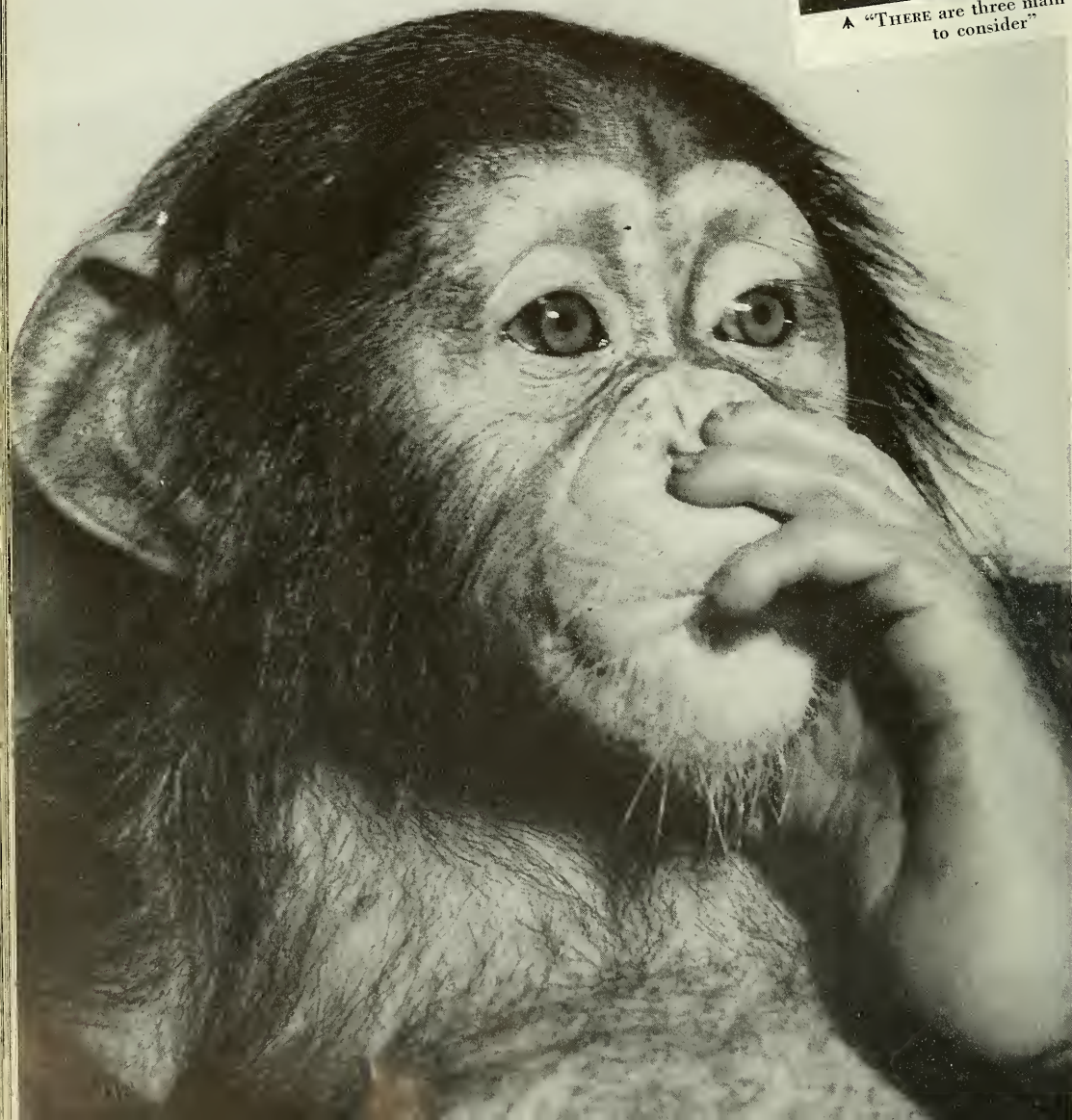
▲ SOME are flatish on top, others rounded or irregular. But as for their purpose, that's anybody's guess

If Christine were an actress and were cast to appear in a Hollywood production, her facial expressions could be used to convey many meanings. But we warn you: the portraits on this page serve to show how easy it is to make a scientific mistake. We call this series,

"Madam Chimp at the Board Meeting."



▲ "THERE are three main point
to consider"





ou fellows have only thought of two"



▲ "YOU'VE LEFT jet propulsion out of the picture"



▲ "WELL, I suppose if the cost of materials doesn't go up"

Christine

The chimpanzee who found a home and turned it into a circus

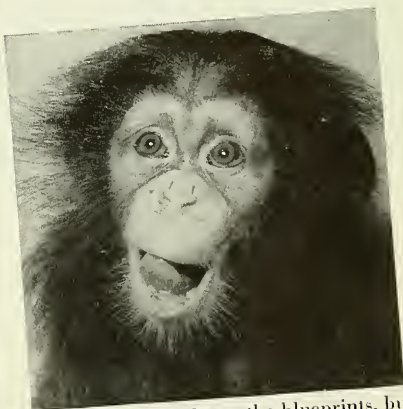
By LILO HESS

All photographs by the author from *THREE LIONS*

Part II:

CHRISTINE did not care for sun or heat. On bright cool days in the fall she was happy. She wore a woolen sweater, corduroy pants and booties. The booties were knitted in the shape of mittens to al-

low for her opposing big toe and so as not to hinder her climbing. Dressing a chimp in human clothes disturbs some people; but to keep the animal healthy, you have to put on shirts and sweaters as the



▲ "It looks all right on the blueprints, but . . ."



◀ "If you ask me, it's taking an awfully long chance"

➤ "I can hardly wait to see the new model"



Plausible though such interpretations may seem, specialists in the psychology of apes tell us that expression-like these on the face of the chimpanzee do not usually mean what people are apt to assume

outside temperature requires. I soon got used to seeing her this way, and Christine seemed to feel strange if she had nothing on. She had never objected to any form of clothing. I was determined when summer came to try to get her used to going naked when the weather permitted.

It was a strange sight to see her dressed up like this, running after her kitten or playing in the sand or water. When she stood in front of the water-filled dish, absorbed in her play, her position was crouched, her knees bent. This made her "little-bow" legs appear more bowed than usual. She would throw little sticks and stones into the water and laugh at the splash. She would poke her fingers into it or swish a twig around in it and then lick off the water. Sometimes she would play twenty minutes like this.

Twenty minutes was a long time in Christine's life. Except for her swing, nothing usually amused her longer than a few minutes. Even washing clothes lost its charm after ten or fifteen minutes, but she liked to return to it after a spell of rougher exercise. She would climb up the leg of the sink, play with the soapsuds, suck the water out of the material, and splash everything around. Another game she stuck to longer than five minutes was jumping off chairs. She would climb to the seat and leap off into space, usually laughing loudly as she came down hard.

For a while she was fascinated by mirrors. As all babies and many animals do, she looked behind the mirror to find the other little ape, but when she could not see it, she was content with making faces and kissing the image. At one year of age, she liked to see the glass cloud up with her breath, and she would then wipe it clear with her hand. I don't know if she breathed on it purposely or if it just happened when she pressed her face to it.

Many of her actions were difficult to interpret. She liked to look at pictures in magazines or books. I have shown her photographs in

which apes were portrayed to see if she would recognize them as familiar. When asked, "Where is Christine?" she would point to the ape as often as five or six times in a row, then at the seventh time she might point to a bar of soap or a whiskey bottle in an adjoining ad. Did she just get tired of pointing, or did she not know the difference? I can only say that the first few "points" were always at the correct picture.

When she was shown a picture of a cat, there was no doubt at all that she recognized it. She would pick the cat picture out of any number of illustrations placed before her. She would make a little soft noise, kiss it, and scratch on the picture as if to pick the kitten out. She would recognize drawings of cats and even dressed-up kittens like the ones in children's books.

She could also identify a horse and a chicken. We have a set of six little blocks with pictures on them. If the blocks were set up so that there were unfamiliar subjects on five of them and something she knew on the sixth, and if she was then asked, "Where is the chicken?" (or horse, or cat)," she would point to the correct one. If a chicken was shown and the question was, "Where is the kitten?" she would not point to anything but would look around the room or even turn the blocks over to see the other side. But when a cat and a chicken were shown together and she was asked, "Where is the chicken?" she had eyes only for the cat and would go to this block and make a fuss over it. I do believe that this behavior showed her great fascination for her cat and not a lack of knowledge. At times like this, her inability to speak worked to her disadvantage.

On the whole, she made all her basic needs well understood. I taught her to clap her hands together ("please") if she wanted some food. She learned this in short order by being given something good to eat in return. So far, she could not master a loud clap but

would wave her hands madly about. When she was just about one year old, she varied this routine of her own accord. If she wanted food, she would wave one of her hands rapidly in front of her open mouth. But she would wave both hands if she wanted something not related to food—to get down from the diaper table, off the potty, or into a room where the door was closed, or if she wanted a toy out of reach. Of course there were times when she would come and stand in front of me waving both hands and looking expectant, and I didn't know what she wanted. After a while she would give up and sadly trot away.

She had a vocal language and used it frequently. She would give a sharp bark when she was excited or angry. She gave a high screech when in a rage and a soft sobbing sound when really unhappy. She said "hoo-hoo-hoo" when upset. She had several food sounds that indicated:

- 1) something very good, "ahh-ahh,"
- 2) something interesting, "ee-ee-ee,"
- 3) food in general or hunger, a short "oh-oh-oh."

This general food sound could also be interpreted as a sort of "yes" or acknowledgment. When asked "Do you want this orange?" she would drop whatever she was doing, give that sound, and come running. She made the same sounds also when shown a favorite toy and asked if she would like it. At the command, "Go get the kitty," she would run off and look under the couch or a chair, saying her "oh-oh." She laughed a muffled "hea-hea." She also made a combination of sounds, the specific meaning of which was not quite clear to me.

Most psychologists doubt that those sounds are made voluntarily and argue, therefore, that they cannot be called a language. Mrs. Cathy Hayes, speaking of her chimpanzee Viki in *The American Weekly* for October 19, 1952, says: "People often ask us if chimpanzees



◀ THE FIRST TIME Christine saw a ball she was a little scared



➤ SHE ROLLED the ball about a little before she picked it up



▼ THEN she held the ball in her hand and dropped it, repeating this over and over again



▼ SHE became so fond of her ball that she would start to cry when someone tried to take it from her



have a language of their own. They do have several distinctive cries and barks which express emotional states, but these cannot properly be called language, since the animals are unable to make them voluntarily. The sounds simply burst out under the appropriate stimulus."

Christine's sounds were stable to a certain extent. She would not say her worried "hoo-hoo" when she wanted food, nor would the sight of food evoke her food sounds when she was not hungry. Anything I might offer her would be greeted by utter silence. Only if it was something she relished, and only after sampling it, would she say, "ahh-ahh-ahh" for "very good." She knew certain foods by sight—grapes, cherries, oranges, apples, candy, and ice cream—and if she was hungry, she would greet these right away with the pleasure sound, never with the general food sound. But after a meal, she would not be interested in these things at all

and would make no sounds for them. The exception was ice cream. She was so fond of it that at the very sight she would get excited and eat it, no matter how full she was. There were various things she did not like, such as spinach, lettuce, carrots, and even bananas, and I never heard her make a sound of any kind when they were offered, though she would eat them when hungry.

Christine usually laughs when tickled, but if strangers are around and she is not at ease, nothing will induce her to laugh. After a month's separation from her cat, she was so happy when it came back that she smothered it with kisses and said her "ahh-ahh-ahh" for a long time. It seems hard to believe that all those expressions are just reflexes beyond her control.

Christine is still such a baby that the absence of language is not too disturbing. If she wants to go to sleep, she just crawls into my arms, yawns, and wiggles about until comfortable. She is not in the least concerned about what I might be doing at the moment. If I am standing, she climbs my leg as if it were a tree and then pulls herself up on the clothing. To resist her only invites a wrestling match with a four-

handed octopus. If she wants to open a door, she first tries to do it herself by standing on tiptoe to reach the knob. (So far she has been unable to reach it, but I am looking forward to six months from now, when she will be tall enough to do this.) Then turning to me, she waves both hands for "please."

If she wants a drink of water, she makes a variation of the food sound, something like "or-or" and says please by motioning with her hands. If she can, she goes directly to the sink and turns the faucet to help herself. She never shuts it off, though.

Her growing independence gets her into a lot of trouble and keeps me on the run all day. Recently she has developed the annoying habit of slamming doors shut and then getting into all sorts of mischief. Of course, it is not done on purpose or deliberately to shut me out. To interpret it as such would violate all the rules established for the behavior of these animals. As soon as Christine sees something she wants but knows she should not have it, she slams the door shut with me in the other room. By the time I get there, she has helped herself and is playing with the broken pieces. She seems par-



▲ CHRISTINE looked behind the mirror to see the other little ape



➤ SHE liked to kiss the image and make faces





◀ SHE stood on tiptoes to reach the doorknob . . .

▲ . . . and would jump off a chair as often as 38 times in a row

ticularly naughty when I am on the telephone, in the bathtub, or washing dishes.

When Christine was a year old, she had twelve and a half teeth, weighed fifteen pounds, and stood twenty-one inches high. She was a gay and lively baby. She laughed most of the time and was very alert and inquisitive. There was little resemblance to the solemn little ape of six months that toppled over every time she tried to sit up. She now got three meals a day, which consisted of cereals, baby foods (the meat and vegetable variety), fruits, and milk. In the morning she never seemed very hungry, and I usually had quite a struggle to get her to eat. A little later, she took a fancy to toast with lots of jam and some milk with a drop of coffee in it. Her regular food was supplemented by a diet of her own. Soap headed this list, but paper, wood, plastic, toothpaste, and string followed close behind. She also developed a taste for sour pickles. Naturally she was fond of all sweets and most

fruits, with the exception of bananas.

Her days were spent running, jumping, and climbing. She became less interested in her old toys, though at times she played quietly with them. She favored her hobbyhorse and almost any pull-toy. She swiped an old pocketbook of mine and delighted in carrying it around on her arm or shoulder. She would open and close it and put little objects into it, retrieving them by sticking her head inside the bag and picking them out with her lips.

She was also very fond of riding in the car. I used to have her ride next to me in a baby chair; but as she got older, she started to climb about and from time to time would fling herself around my neck to kiss me or to take a nap. Since it was hardly safe to have a little ape leap at you suddenly while going fifty miles per hour, a wooden frame was constructed to shut off the rear seat, making a separate compartment. There Christine had plenty of room to play around and could look out of the windows,

which she enjoyed doing. She would slap her palm or fist against the windowpane, hoping to get people to wave to her. If someone responded, she would jump up and down, hooting or just smiling happily.

Otherwise it was hard to tell if she had any feelings about the things she saw, though she watched everything with fascination. Mrs. Hayes gave me a surprise when she told how her chimp Viki (*The Ape in Our House*) seized her in panic when tombstones appeared at the edge of the highway on both sides. For a moment, I wondered whether my Christine was quite bright. Not knowing the sinister implications of tombstones she did not react one way or other to them. She does get startled, though, when cars honk close by. And she has recognized cats through the car window, becoming very excited and tapping on the window more vigorously than usual. It has always amazed me that she should be interested in attracting the attention of strangers when she is in

the car, since she normally is very timid and shy with anyone she does not know. Recently she has become more confident, though, and solemnly offers her hand in greeting.

Christine is still a very cautious baby, and all kinds of strange fears live in her. They govern her life like primitive taboos. Some of them she has outgrown, but others are still very much a part of her. One of them is a dark mark on the floor on which she dare not step, another is a little blue cup which she will not touch, though she likes an identical pink one. She will not climb on a certain chair and cries when I put her on it, though she will crawl up and down all the others. There is a little brick walk leading from the house to the driveway. The bricks are all the same size, varying a little in color. There is one she will never step on. She goes around it or steps over it. If her foot is forced onto it, she starts to cry. In one room she will only step on the rugs, never on the floor boards. When she was small, she was afraid of the color red, screeching hysterically when anything red was put near her. Now red is obviously her favorite color. She has a red sweater which she loves, and anyone wearing a similar color gets her immediate attention.

Christine is afraid of all sudden noises. She was this way when she came to me and has not changed much, except that she has gotten used to some of the sounds—except the ring of the telephone. When she is startled suddenly, she leaps into my arms, clings to my leg, or dashes to find her blanket. If neither is available, she lies down on the floor and screams in terror. In my arms she apparently feels perfectly safe and does not mind how close I take her to the frightful sound or object.

But a few weeks ago she took a different attitude. I wanted to photograph some of her leaps off a chair, and since the motion is so fast, I set up my speedlights. When she saw the big black electric cables, she got into a panic and ran

into the adjoining room, throwing herself on the floor and yelling at the top of her lungs. I ran to her, and she jumped into my arms, quieting instantly. I put her down, and she picked up one of her toys and started to play, as if nothing had upset her. But when I turned to go back to the camera, she dropped her toy and ran after me, holding me back with all her might. When I tried to free myself, she began crying a soft unhappy "hoo-hoo." Not until the strobe unit was put away did she calm down and resume her jumping game. I had to take the picture with regular flash, which she does not mind.

Besides being easily frightened, Christine is a stickler for rituals or habits. If she is accustomed to anything, the slightest change annoys her. The board of her swing was replaced one day with a little broader one to give her more room for sitting. She was so disturbed by this that she avoided the swing for a week. A different kind of pillow or blanket in her bed will be picked up and thrown out emphatically with a loud, angry bark. When she gets a new toy, she usually places it on the floor and dances around in a circle for a few minutes, in a manner similar to the Mexican hat dance. Maybe she wants to make sure it doesn't bite. When all the things around Christine remain stable, she is happy, and her time is filled with hundreds of busy little activities.

I have read that certain instinctive habits assert themselves in the chimpanzee even though the animal is brought up without contact with its kind. Christine has just started such a habit. She makes a sort of nest out of blanket and towels when she goes to sleep in her playpen. She puts them all in a pile and lies on top of it. But this occurs only before the short naps. At night she will not go to sleep until she has her pajamas on and is tucked into bed. Then she plays a little with one of her toys and presently goes to sleep. Up to now, she has not learned to cover herself, and I have to go down

and do this several times a night. I am always afraid she might catch a cold.

Recently she has taken to coming upstairs at least once in the middle of the night. Sometimes she seems to be just lonely and in need of affection and company; sometimes she apparently wakes up from a bad dream, for she whimpers as though scared. She trots up the stairs with her blanket in tow and crawls into bed with me. There she snuggles deep under the covers and goes to sleep within a few seconds. As soon as she is asleep, I carry her down again without waking her. But at 7 A.M. sharp she is back in my room and ready for a day full of fun.

I often think back to the first few weeks she was with me. I can still see the tiny baby that used to rock nervously back and forth. This rocking motion one sees so often in caged chimpanzees lasted only a few weeks with Christine and has never recurred, even when she is startled or unhappy about something.

She is very good-natured and never holds a grudge if something does not work out the way she wants or expects.

She is bright, alert, and intelligent. It is hard for me to say *how* intelligent, since I have only had experience with this one ape and therefore lack a standard of comparison. I have never given her any of the customary intelligence tests, such as pulling strings to get food, lifting cans for concealed grapes, pressing levers, or solving similar puzzles. I cannot see any sense in repeating them or any variation of them, since it has been established by reliable scientists that a normally intelligent ape can and will solve these problems correctly. Naturally, there are bright apes and stupid ones, good-natured apes and "hotheads." Some are tinkerers and are willing to figure out a man-made puzzle; others will give up after a short try. Christine does not prove the theory that for food an animal will do almost anything. Even bribing her with ice cream



▲ WHEN Christine wanted something from the sink, she would open the doors of the cabinet and climb up



▲ WASHING CLOTHES fascinated Christine, and she never missed an opportunity to "help"

won't do the trick if she is not in the mood. (Of course, I have never starved her for days to test her co-operation).

I have been with Christine twenty-four hours a day, and yet I have found no way to understand her fully or to figure out how her mind works. It is so different from ours. She has adapted herself remarkably well to civilization. To test the intelligence of an ape that spends its life bored in an empty cage at a zoo seems unfair to me. Yet I don't feel one should make statements about the intelligence of a home-raised ape either, since it is so hard to see what the animal has acquired through learning (though it might not actually have been taught) or what it has figured out by itself.

I am quite sure that Christine knows more than she will show and that she refrains from doing certain things just so she can get attention or simply because it is easier to have someone do them for her. At about one year of age, she pretends not to know how to use a spoon. She puts it into her mouth well enough, but then she only waves it in the direction of the food, expecting the spoon to fill

▼ SHE would stand with bent knees while playing in a flat lid of a crock that held a little water



itself. Since she has learned much harder things than to scoop up food, it makes me wonder how much laziness is involved. Given a bowl without a spoon she has a hard time, too. She puts one finger into it and licks it. That process is too slow for her, and soon she puts her face into it. But that is messy, and she does not like it, so she just cries or barks impatiently for me to come and feed her. Yet she has figured out how to drink from a faucet. She turns on the water by herself, leans far over to drink, or holds her hand under it and sucks up the water from the back. She can unscrew bottle tops, turn door-knobs, and knows how to open pocketbooks with different kinds of clasps. If she wants an object out of reach, she now pushes a chair or box to the spot and climbs up. If she wants something from the sink or a cabinet that has doors below, she will open them and climb up on them.

She used to astonish me by the way she seemed to sense how to handle new toys. The first time she ever had a ball in her hands (I am reasonably sure that she never had anything like that before she came to me), she handled it very well indeed. First she was frightened by it, but soon she picked it up and held it high over her head and let it drop down, laughing as it bounced and rolled. Then she went after it and repeated the action over and over again. She held her stuffed animals tenderly, hugged and kissed them, and put them in her stroller. She pulled her little wagon or truck by the string from the very first without demonstration, usually holding the string in her mouth.

Christine now understands any number of things that are said to her. The meaning of "no" and "Don't do that" were among the first she learned. She stops immediately when told but often re-

sumes the forbidden activity as soon as my back is turned. She knows the meaning of "breakfast," "lunch," and "dinner" and comes running when any meal is mentioned—if she is hungry. She understands "Go to your high chair," "Go to bed," and "Pick up your towel (or doggie, or teddybear, or any food she may have dropped)." She kisses her "mama," her doggie, or her kitten on command. She hands over whatever is in her hand if told "Give it to me." She shakes hands, waves "bye-bye," and understands any number of similar everyday things.

Her vocabulary has increased tremendously in the six-month period, and so as her ability to express herself. Just recently she started to point at things she wants. It will be interesting to see if she will make use of this often, and what other ways she will invent to make herself understood.

the end



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► IN "THE LIVING DESERT," Disney's first full-length True-Life Adventure film, a Redtailed Hawk fights with a rattlesnake

▼ A wasp approaching a shaggy tarantula, which the female stings and paralyzes to use as a host for its hungry larva. The wasp here looks more like a male



The Living Desert

Reviewed by HAROLD E. ANTHONY

*Deputy Director and Chairman
and Curator of Mammalogy
The American Museum*

THE first feature length True-Life Adventure put out by Walt Disney is a splendid natural history sequence called "The Living Desert." The area is the Great American Desert lying east of the Cascade-Sierra Nevada rain barrier and extending from Oregon to Mexico. This interior basin varies from areas with scanty rainfall to regions with practically none at all, and the plant and animal life existing under these conditions needs special adaptations to endure the exacting demands of such an environment.

▼ A KANGAROO RAT meets the lethal sidewinder



The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

The film begins with a graphic, easily understood presentation of the physical factors that create the desert. The layman might well believe that this bleak association of heat, drought, and barren topography had so little attraction for living objects that none could survive there. But

this is a fallacious idea, for there is a wealth of interesting animal and plant life to be observed by anyone skilled in desert lore.

And the Disney photographers certainly have the skill to locate this life and record on film an epitome of desert activity that is as surprising as it is unique. Without detracting from the ability of the photographers by stating that they must have been very lucky to catch such spectacular behavior, one can state that they were fortunate, and so is the film audience.

There is constant action in this film, the cast is large and varied, and because much of this action is normally nocturnal the wonder is how it could be captured on film. High lights include the treeing of a bobcat by peccaries, a fight between a wasp and a tarantula, the courting dance of the scorpions, the adventures of ground squirrels, kangaroo rats, pocket mice, and the appearance of spontaneous bloom when moisture puts in a rare visit.

The marvels disclosed in this film must be seen before one can sense their full significance; a word description can not do them justice. Also this film runs for seventy minutes and too many words are needed to merely catalogue the events.

"The Living Desert" is part of a pack-



age that includes "Stormy," the story of a thoroughbred horse, and "Ben and Me," a humorous cartoon novelty showing how Ben Franklin came by his bright ideas.

"Stormy" is a sympathetic, rather emotional, portrayal of the stages by which a thoroughbred develops an inferiority complex, becomes a polo pony, and comes into pride of achievement in the winning chukkers of a polo game. In some respects it is reminiscent of *Black Beauty*, and it is clean entertainment. It could have been done by any of the good companies and shows little of the character that only Disney has been displaying.

"Ben and Me" is typically Disney in its whimsical imagination and cartoon execution. The episodes have a historical basis, but the use of a "poor church mouse" as the master of ceremonies is a stroke of genius. This sequence is excellent and relaxing entertainment and leaves the beholder with some doubt as to whether it is better to be a man than a mouse!

◀ GARY COOPER, star of United Artists' new film "Return to Paradise," lands on a tiny South Pacific island, the locale of the film

▼ "RETURN TO PARADISE" questions the responsibility of civilized people toward the native people they almost always injure



Return to Paradise

Reviewed by GORDON F. EKHOLM
Associate Curator of Archaeology,
The American Museum

The story is taken, of course, from Michener's book of the same title, which was a very successful attempt to portray what has been happening to the various

peoples of Oceania during recent years and especially with the greatly increased contact with Western culture caused by the war in the Pacific. For each of nine areas within the Pacific he gave a factual account and recorded true stories of actual people, followed in each case by a fictional piece based on those materials. The present movie is taken from the story entitled "Mr. Morgan," altered somewhat to include a "return" and thus permit the use of the title "Return to Paradise."

But as a movie it is good fun and, broadly speaking, seems to give a fairly authentic view of a Polynesian Island community with its combination, on the one hand, of modern ideas and gadgets plus a touch of the war, and, on the other, the customs and flavor of the native culture. As might be expected, it is the differences in sex and marriage customs that are primarily emphasized, but these are important differences and make it a movie that will sell. Filmed in Samoa in what appears to be a real native village and with most of the actors real Polynesians, it seems fairly accurate in detail and, in this regard, should not overly offend those who know Polynesia at first hand. It is South Seas fiction employing most of the conventional movie techniques of oversimplifying human reactions into nothing much subtler than pure black and white—despite the technicolor—but, nevertheless, a good show.

Brief comments on films previously reviewed

Documentary and Grade A

Below the Sahara

African wildlife film made on location

What the Experts Said

Interesting sequences of African fauna and native peoples. Authentic flavor

Prowlers of the Everglades

A Disney True-Life adventure film

Fine natural history, which loses none of its drama by being factual

The Sea Around Us

Marine natural history filmed in color

Some superb shots, but as a whole a highly disappointing production

Down the Alphabet

White Witch Doctor

Fiction with an African background

Some very interesting and unusual glimpses into primitive Africa. Good entertainment

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LETTERS

continued from page 338

ing is more often read *into* rather than *out* of it. Relying mainly on what others have said and written, I offer the following interpretations, which may be of interest to travelers in the West:

A straight line may mean a trail.

A straight line broken by dotted gaps may mean a trail obstructed by gullies.

A line of small circles connected by straight lines is said to denote succession of time among the Dakota.

A zigzag line often means a snake, as may also a spiral.

A series of meander lines may mean waves on water.

A series of V shapes may stand for birds in flight.

A series of bisected V shapes, bird tracks.

A foot with long toes, bear tracks.

A triangle or a connected series of triangles are variously interpreted as mountains, clouds, and tepees.

A horizontal half-circle with vertical lines hanging from the straight underside is definitely recognized as a cloud with rain descending.

A cross with a circle around it is said to be a "world symbol," the cross indicating the four quarters.

Two circles with extending spokes or rays, the "sun effigy."

An arrow is said to denote a prayer.

Some of these interpretations are more or less local; and obviously, not all are to be taken as having just the precise meaning indicated. Numerous illustrations have been published for about 300 sites in the West. The reader seeking further information is directed to a 238-page book, *Petroglyphs of California and Adjoining States*, by Julian H. Steward (California Univ. Press).

Lizard Eggs

Sirs:

I should like to know how the American Chameleon's eggs hatch. I purchased two chameleons at a circus. Before I had removed them from the box in which they came, the larger chameleon had laid two eggs. The smaller chameleon im-

mediately pushed one egg into a corner of the box and kept poking it with its nose. The egg reacted like a rubber ball when pressed. Thinking the animal meant to destroy the egg, I removed both eggs and placed them on the dirt in a window box and covered them with a plant leaf. Nothing happened, the eggs just dried up and disintegrated. Afterward, I thought perhaps I should have allowed the chameleon to continue his "poking operation." Can you tell me?

From a reader of NATURAL HISTORY

Answer:

The poking described here was probably just an exploratory action on the part of the lizard. Or, perhaps, the smaller of the two lizards laid the eggs and was attempting to move them to a point of seclusion. Immediately after laying, a mother lizard will occasionally poke her eggs in the manner described in attempting to cover them. In either case, the action is not related to the hatching process.

The Carolina Anole or so-called "American Chameleon" (the true chameleons are very different lizards inhabiting the Old World) normally lays two eggs during June, July, or August. The eggs are placed in leaf litter, in decaying logs, under the loose bark of dead trees, or under rocks and logs. After depositing the eggs and covering them, the female has fulfilled her role of motherhood. She does not stay with the eggs to protect them, as a few other lizards do, or give the young assistance or attention.

The eggs hatch four to eight weeks after being laid. By this time the leathery shell has become thin, and at one point it has been nearly eroded through by the action of chemicals within the egg. As in other lizards and snakes that hatch from eggs, the developing embryo has a special tooth that projects forward from the roof of the mouth, known as the "egg tooth." This tooth is believed to slit the thin egg shell in the hatching process and is shed shortly after hatching. It is definitely known to serve this purpose in some lizards, whereas in others the shell may be torn open by the claws of the embryo or may simply be ruptured by internal pressure.

JAMES OLIVER

Sirs:

... NATURAL HISTORY Magazine is one of the most wonderful, enjoyable, and valuable publications issued. The good it does toward encouraging the preservation of our heritage is incalculable. It is first on my reading list, and I never pass an opportunity to call the attention of others to its advantages and pleasures. Those who contribute to it and work on it merit the appreciation of all.

GEORGE W. PAXSON

Monroe, Mich.

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How to select picture-taking accessories

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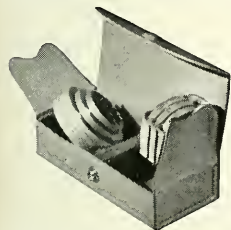
what you can do, at home, afield, day or night?

All of these things can be done simply...and within a modest budget...with the Kodak accessories described on this page. You need only decide what you want to do. Then let your Kodak dealer show you the accessories that fit your purpose.

For pictorial effect. Filters put you in charge of any picture situation. Certain colors that might dominate your picture can be restrained, others can be emphasized, to give you the color balance you want. Your choice of filters will depend upon the effects you want, and the film you are using.

One of the most common reasons for using a yellow filter is to retain clouds in the sky in black-and-white shots. The Kodak Cloud Filter, for use with the simpler cameras, requires no increase in exposure. The popular K1 and K2 filters give progressively richer sky tones for more cloud contrast.

The K2 filter is also often used for accurate color correction with panchromatic film. Red filters, such as the Kodak Wratten A Filter, produce the spectacular effect of an



almost black sky, with white clouds. Such a filter often improves architectural subjects. The A filter can be used only with panchromatic or infrared film. A Kodak G Filter, deep yellow in color, gives high sky contrast and tends also to separate the tones of green in landscape subjects. It is excellent for reducing bluish atmospheric haze.

For color work, the most popular and useful filter is the Kodak Skylight Filter; this cuts out the excess of blue in hazy-day and open-shade shots. Next, the Kodak Daylight Filter for Kodak Type A Color Films; this enables you, in emergencies, to get good daylight shots on Type A films. And for flash shots, the Kodak 81C Filter assures more accurate rendering on Type A films.

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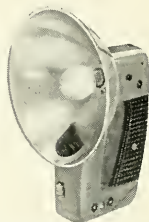


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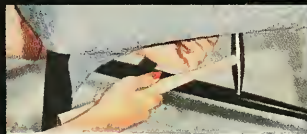
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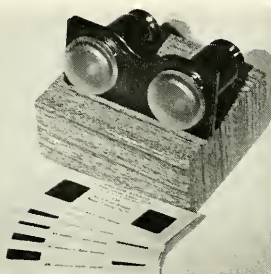
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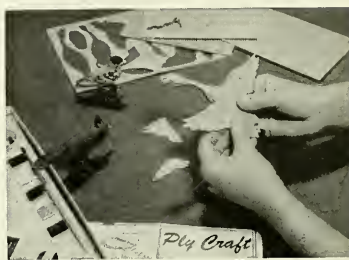
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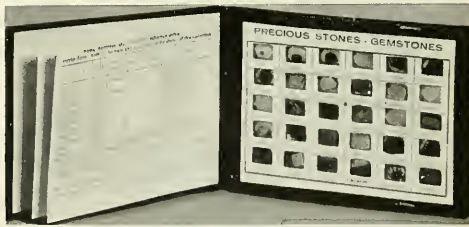
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New York 24, N. Y.



Photo by Nicholson from Hugo H. Schroder

▲ FLYING SQUIRREL outside of nest of Spanish moss in a Florida orange tree

LETTERS

Scorpions Without Food or Air

SIRS:

Scorpions have a wicked sting! When we arrived in Florida for our first visit, we were briefed on many things, but the most important was never to put on our shoes without first rapping them to be sure no scorpion lurked inside. They love darkness and cozy places.

Our living room opened onto a screened porch, and the connecting door usually stood open. One evening in early April my sister gave a scream, and I saw something scuttle along the threshold and stop near a table leg. It wasn't a mouse. I grabbed a shoe and we went into action, killing a scorpion with a body about the size of a quarter. The next morning our landlady, who had never seen one in all her years in Florida, sprinkled our apartment with sulphur and laughingly remarked, "They usually come in pairs." But we had no further visitors.

Soon after this, we began to pack up for our return trip and stored several suit boxes under a couch until we were ready to start. Along the way we did

some visiting and reached our Connecticut home May 2.

While my sister was unpacking that afternoon, she shook out a dress that had been in a suit box in the trunk of the car, and we proved that they do come in pairs; for clinging to her skirt was a scorpion! I rushed upstairs with the tongs, and we dispatched Mother Scorpion only to find she was covered with babies about an eighth of an inch in diameter, which ran in every direction. But we finally got them all.

How long can a scorpion live without food or air? Thirty days? It was from April 3 to May 2.

Miss JESSIE M. BALDWIN
Willimantic, Conn.

Mr. John C. Pallister, Research Associate in the Department of Insects and Spiders at the American Museum, comments as follows:

There is an old belief that scorpions travel in pairs. This is not entirely true; but since they are somewhat gregarious, it frequently happens that where there is one, there are more.

Yes, scorpions can live a long time without food. Thirty days and even longer. They cannot live too long, however, without air. Sealed in a small

container, the oxygen would become exhausted and the air contaminated until it reached the point where the scorpion would die. One to two days, depending upon the size of the container, the temperature, and other governing factors, would be about the extent of their existence. But in the suit box of clothing—an ideal place for the mother to bear her young—there would be sufficient air for the scorpion to live quite comfortably for some time.

The scorpion lays no eggs but produces living young, which immediately attach themselves to the mother, clinging to all parts of her body by their pinchers, or forceps. They travel with her for some time, probably sharing in the food she captures. They drop off one by one as they grow larger and are ready to shift for themselves.

Parakeets Don't Go Back Home

Sirs:

Roger Tory Peterson, in his wonderful book, "A Field Guide to the Birds," reported that the exotic parakeet sometimes escapes from captivity and is mistaken for the extinct Carolina Parakeet.

I have one of these birds myself and have often wondered if it came from Central or South America or from Africa.

Another question that has bothered me in this line is whether these escapees have the instinct to return to their natural habitat, even though they may be the offspring of several generations of domesticated birds.

Your faithful subscriber,

RUDI FRANKE

Linden, N. J.

We have obtained the following information from Dr. John T. Zimmer, Curator of Birds at the American Museum:

The parakeet in question is probably (but not necessarily) a budgerigar or Australian grass parakeet. It is one of the common cage birds at present, possibly in special favor because of the variety of colors that have been developed in the captive strains.

I doubt, however, that escaped individuals would make any effort to travel to their ancestral home. In the first place, the species is not migratory and has no innate urge to perform long-distance flights. Its wanderings are largely vagrant or, if more regular, are simple movements to and from feeding grounds and roosting or nesting sites, much as they are with domestic pigeons.

What would happen in the case of an adult brooding bird taken from its young and transported some distance before release is another story. Such a bird might readily make an effort to return to its charges. Experiments with various species have shown the uncanny ability of some birds to find their way home under such

continued on page 432

NATURAL HISTORY

The Magazine of the American Museum of Natural History

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November, 1953 Volume LXII, No. 9

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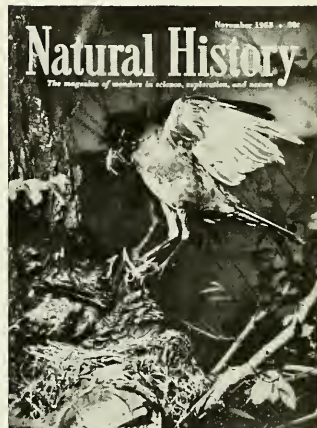
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THE COVER THIS MONTH

Regardless of how familiar the robin is, a photograph like this one permits a closer view than it is easy to get of some of the details of the bird's family life and its flight. George Blake Johnson, of Framingham Center, Massachusetts, who took the photograph, has specialized for several years in the taking of stereoscopic photographs of birds in color with the use of strobe lights. The exceedingly rapid exposures possible by this method permit stop-motion photographs of the most rapidly moving birds, but the problem of opening the shutter at the right instant presents great difficulties. Mr. Johnson has overcome these by use of the electric eye. He studies the activities of a nest of birds from a blind until he knows their habitual movements with great precision. He then sets up his camera and places the electric eye in a position where it will actuate the shutter at the proper moment for the composition he desires. The result of his painstaking work is a growing collection of stereoscopic views of a sort the human eye could never glimpse unaided.

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KANGAROO

----- by Henry G. Lamond
John Day Co., \$3.50
247 pp.

THIS book tells of the life history of the big red kangaroo and employs a fictional pattern, which appears to be rather soundly based upon observations of the animal's habits. Fictional biography of wild animals usually presents many pitfalls to the author, who usually falls into one or more of them.

Writers such as Kipling and Seton have given us entertaining and instructive text, which an intelligent reader can screen for fact and fancy. Other authors have so mingled what is known with guesswork and anthropomorphic rationalization that the reader does not know what to trust and may be skeptical of the entire product. Lamond is openly dubious about imputing reasoning or calculated decision to the kangaroo.

He imagines the action described in the book, but one feels reasonably certain that it is a composite built up of numerous events that actually happened. This impression is created by the familiarity with the Australian environment shown by the author. Australian vernacular is frequently used (translated in a glossary) and the climate, topography, flora and fauna of the world-down-under all appear in character with an animal of unique behavior.

Lamond is sympathetic with his subject, he balances the good against the bad, he shows a proper sense of proportion. His narrative runs through pretty much of all of what may happen from the time a kangaroo is born until it reaches senescence. These episodes are dramatized, but not to the extent they become impossible, and the net result is an interesting and readable book, which will leave the reader better informed on Australia than before he read it.

HAROLD E. ANTHONY

EYES IN THE NIGHT

----- by Bengt Berg (translated by Lynette Jarbo).

Dietrich Reimer, Berlin, DM 11.50
163 pp., 54 illus.

THE twenty or so books by the Swedish photographer and nature writer, Bengt Berg, have enjoyed a great vogue on the continent, but this is one of the few to be published in an English edition. Berg, in keeping with his own

sympathies, writes about dramatic and powerful creatures. His earlier photographic excursions were for rhinos, lions, and the great lammergeier (lamb vulture) of the Himalayas; this time he turned his attention to the fierce eagle owl of the Baltic Islands, a freebooter whose bill of fare includes goshawks and prowling cats. Yet one of the young owls, adopted by the naturalist, had many engaging and playful habits. The 57 excellent photographs illustrate the life of the eagle owl and of other animals that live in the same forests. *Eyes in the Night* is a very worth-while and interesting book.

D. AMADON

A GUIDE TO BIRD FINDING WEST OF THE MISSISSIPPI

----- by Olin Sewall Pettingill, Jr.
Oxford Univ. Press, \$6.00
709 pp.

THIS highly original work is the second of two volumes, the earlier of which covered the eastern United States. The set comprises a unique "ornithogeographic" guide, as useful for rich and concise description of climate, landscape, and major vegetation as for finding birds. The two books have already been aptly described as "Baedekers" of natural resources.

The volume dealing with 22 western states is extraordinarily meaty, with text running to over 700 pages. Discussion of greatly diversified California requires 75 pages. Travel directions are linked up with highway route numbers and with national parks and monuments, federal, state, or private refuges, and with museums, universities, and other centers of special interest to naturalists. The book is not aimed at the identification of birds but rather at telling where they may be found. It is illustrated only by a series of competent and decorative small line drawings by G. M. Sutton.

Professor Pettingill had many collaborators in his huge task. To these he accords handsome credit, but both the plan and the finish are his own, and the result is equally praiseworthy on artistic, scientific, and functional grounds. Broad geographic descriptions of the natural divisions of each state, which are also mellow with historical content, are followed by notes on well-selected localities (22 for

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Horace G. Richards
The Academy of Natural Sciences, Phila.
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Harvard College Observatory

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Texas), each of which serves as a hub for the surrounding terrain.

The temptation to quote at length from this significant book or to point out items of its abounding information is almost irresistible. Of ornithological errors the reviewer has noted but one, the time-worn statement that the California condor is "the largest flying bird in the world." This ignores another condor and one or more Old World vultures of equal size, as well as the fact that the great bustard is heavier and the wandering albatross of greater wingspread.

For the traveler who desires to know America "fresh from the hands of its Creator" (J. J. Audubon), or as expanding man has thus far left it, there is no better field equipment than this volume and its predecessor.

R. C. MURPHY

TORNADOES OF THE UNITED STATES

by Snowden S. Flora

Univ. of Okla. Press, \$3.50

194 pp., 36 illus., 10 figs.

TORNADOES have taken an annual death toll in the United States of about 245 persons and caused an average property damage of over \$11,000,000 a year. But, because of the nature of tornadoes, progress in the study of them has been slow—particularly in regard to finding a satisfactory forecasting technique.

Unlike the hurricane and thunderstorm, which can be charted and analyzed in various incipient degrees, the tornado presents an aggravating problem for the forecaster. Reliable specific tornado forecasts cannot be made at the present time. At best conditions may be found that are favorable to their development. This makes for a ticklish situation so far as alerting the public to the possible danger of these viciously destructive storms.

For more than 50 years, the Weather Bureau has been issuing warnings of "severe local storms within the next 24 hours" without mentioning tornadoes specifically. It is only within the past year or so that sufficient means of detection and tracking down of tornadoes has developed enough to warrant the actual use of the word "tornado" in a general weather forecast. In some Midwestern cities, plans for tornado detection are either underway or in operation and include use of telephone, short-wave radio sets with independent power supplies, and radarscopes.

Snowden S. Flora, in presenting *Tornadoes of the United States*, has added an important contribution by tracking down the many investigative accounts of the subject, which are so widely scattered, and weaving them together into a comprehensive and informative whole.

This is a most welcome reference and should be eagerly added to the library

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BY

Olin Sewall Pettingill, JR.

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FRANK H. FORRESTER

CURIOUS CREATURES

----- by W. E. Swinton

Philosophical Library, \$4.75
256 pp., 151 illus.

DR. W. E. SWINTON is one of the eminent palaeontologists of the staff of the British Museum (South Kensington) and visited the American Museum of Natural History several years ago. In *Curious Creatures* he has written a little gem of popularized natural history.

A refreshing feature is Swinton's liberal bestowal of credits; he acknowledges original sources from Aristotle down to the many distinguished living scientists whose original researches he so concisely and lucidly epitomizes. His style of presentation may be called "rapid." He has shown a real genius in selecting unusual or little-known examples of animal behavior from the limitless fields of the vertebrates and invertebrates to demonstrate the sometimes quaint subjects included in his chapters. One would, however, like to know the source of a single additional statement—namely, that the promethea moth lays its eggs on the Lady's Slipper!

The illustrations, unfortunately, fall far short of the text. Miss Erna Pinner has apparently never before done work on natural history. The medium used—heavy lines with a dash of wash—is unsuitable. The work bears the marks of haste, and proportion is often wholly lost. The yucca moth, with its delicately fringed creamy white wings, is done with single heavy lines and a splash of wash. The rhinoceros birds on the kudzu cow are made to appear at least twice as large as the antelope's proportions would indicate. The face of the dugong is unrecognizable. The otter, with fur three inches long, appears to have been partly drowned and resuscitated. The great horned owl is more like a feather duster. As for the last picture—the bat crouching on the back of the bull frog—could this be practical joking?

G. H. H. TATE

INSECTS: THEIR SECRET WORLD

---- by Lucy Evelyn Cheesman

William Sloan Assoc.
\$3.50, 246 pp., 17 figs.

ANYONE acquainted with Miss Cheesman would anticipate that anything she might write about insects would be both interesting and pleasant to read. In this book it is obvious that the author has

Continued on page 431

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◀ SIX-YEAR-OLD "SPRAY," a Bottle-nosed Dolphin, makes a jump at the feeding platform for a defrosted blue runner. An adult porpoise consumes 15 to 20 pounds of fish daily

The BIRTH and GROWTH of a Porpoise

An insight into the life processes and behavior of an air-breathing animal that gives birth and suckles its young under water

By FRANK S. ESSAPIAN

*Marineland Research Laboratory
All photographs by the author,
courtesy of Marine Studios*

"DOLPHINS!" The term has for ages evoked in the minds of men a picture of swift, graceful, playful, and friendly creatures roaming the seven seas.

There is a good basis for such a concept, for the dolphins, or porpoises as they are commonly called in America, are indeed engaging and inoffensive animals. Mariners in particular have traditionally subscribed to the view that porpoises are an omen of good luck when seen at sea. In popular belief, porpoises have even been credited with intentionally pushing a drowning person toward the shore or protecting him from sharks.*

*See "Saved by a Porpoise," (a letter) in *NATURAL HISTORY* for November, 1949, page 385.—ED.

Curiosity and playfulness are certainly two of the porpoise's prominent characteristics, and it is not unlikely that on occasion a porpoise may have been seen actually nudging a drowning person in the surf. This behavior has caused many people to believe that a porpoise is capable of purposefully saving a human life. But students of animal psychology point out that it is a mistake to analyze animal behavior in terms of human thoughts and emotions. It is considered highly unlikely that a porpoise could realize that a human was in need of assistance and should be pushed to shore. The truth of the matter is that a porpoise is apt to push a floating box, a turtle, a small shark,

or any other object that may have aroused its interest.

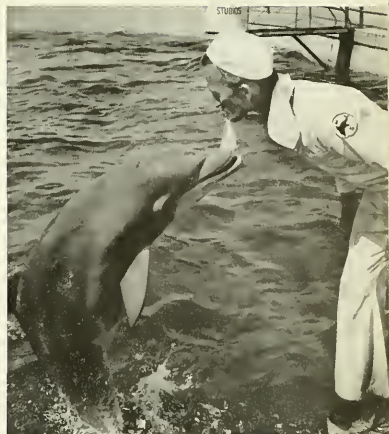
A great deal of information bearing upon the behavior and life history of these remarkable animals was first brought to light and recorded by the late Arthur F. McBride, first Curator at Marine Studios, Marineland, Florida. Later these observations were substantiated and elaborated upon by Dr. Henry Kritzler, former Curator at Marine Studios. Many other well-known scientists have taken leave from their classrooms and laboratories and journeyed to Marineland to co-operate in this research and to contribute to our knowledge of porpoises.

All this has been made possible by

the special facilities at Marineland. The oceanarium, as it is called, consists in the main of two tanks. One is circular, 75 feet in diameter and 12 feet deep, and contains 400,000 gallons of freshly pumped and filtered sea water. The other is rectangular, 100 feet long, 40 feet wide, and 18 feet deep. Here the animals are not segregated into small separate tanks as they are in an ordinary aquarium but instead all live together as they would in the open sea. The porpoises on exhibit are kept in the circular tank, where they can be conveniently observed through windows located at two different levels. Also there is

at hand a modern, well-equipped marine laboratory.

As with other animals, the miracle of birth among porpoises has long fascinated people. The birth of a porpoise is of particular interest because, although these animals look like fish in many ways, they are air-breathing, warm-blooded mammals that have taken to life in the water. Strange though it may seem, not only does conception take place in the water, but birth, nursing, and growth also occur entirely in the water. The young porpoise at birth is fully conditioned to cope with its element. In a newborn porpoise there is hardly a trace of



▼ A SCHOOL OF PORPOISES, alarmed by the presence of a small tiger shark. They cut rapidly across the tank, eyeing him with suspicion. Porpoises can turn their heads up, down, and sideways. They can also move their eyeballs. Their maximum speed is believed to be 30 to 35 miles an hour

▲ WITH UNERRING ACCURACY at the age of fifteen months, little "Algie" leaps to take a fish from the feeding attendant's mouth





▲ **BIRTH OF A PORPOISE.** In all of the births observed at Marine Studios, the baby porpoise came into the world tail first



◀ **SUCKLING.** Several hours after birth, the baby reaches for its first snack of milk as the mother obligingly rolls over on her side

the weakness or helplessness characteristic of most newborn mammals. It is able to surface for its first breath of air unassisted. It can swim, see, hear, and "talk" (whistle). It can even recognize its mother's call shortly after birth. The

relatively long period of gestation (eleven to twelve months) is believed to be in part responsible for the precocity of the infant.

The newborn porpoise simply could not survive if it could not keep up with its mother from the

minute it is born. Very often the curiosity of the other porpoises is aroused over a new baby. As they attempt to approach and examine a new arrival at close range, the mother invariably breaks into a fast swim, maneuvering herself or the baby, now to right, now to left, shielding the baby from the intruders with her body. At such times, baby porpoises have shown themselves to be capable of astonishing bursts of speed.

In all births observed at Marine Studios, the porpoises came into the world tail first. Although this may appear strange to us, since it is at variance with the usual mam-

malian manner of delivery, it is apparently necessary and natural under the circumstances. Otherwise death by drowning would probably result. Birth required anywhere from 21 minutes to several hours; no live birth exceeded two hours.

At the moment when the baby is born, the mother, by an abrupt movement, snaps the short umbilical cord, thus releasing the young one. The baby immediately swims to the surface for the vitally important first breath of air. A newborn porpoise weighs approximately 25 pounds and is 30 to 36 inches long.

Within a few hours after birth, the baby begins to nurse. The mother possesses two nipples concealed in clefts on her underside, and the young one, when hungry, merely grasps either nipple between the tongue and upper jaw and helps itself. But the method of nursing is quite different from that of other mammals, since protracted nursing under the water would not be feasible. In porpoises, the mammary glands secrete the milk into large sinuses, or channels, where it is collected. As soon as the baby grasps a nipple, the mother porpoise contracts certain abdominal muscles and actually squirts the milk into the baby's mouth. Thus, feeding is accomplished in a few seconds. Sometimes, when an inexperienced infant detaches itself prematurely, milk can be seen escaping into the water. The milk is rich in fat and protein.

At first, the mother may roll over on one side to facilitate the feeding. Later, neither the position nor movement matters; after a brief period of maneuvering, the infant learns to adjust itself to the circum-

stances. At birth, the teeth have not appeared. The young porpoise begins to pick up small pieces of squid when about six or seven months old, and later it takes fish to supplement its diet of milk. When approximately a year and a half old the infant is weaned completely.

A young male porpoise we named "Algie," who was born on May 8, 1949, and is now nearly four years old, is the one who figures prominently in the pictures of birth, nursing, playing, etc. He soon became the pet of the immature female porpoises, who took particular delight in stealing him away from his mother and playing with him. Being blessed with a mother who was lazy, unsociable, and sleepy during the better part of the day, Algie was quick to take advantage of the situation. His mother's indifferent behavior was not typical, for other mother porpoises have proved more jealous and resentful when attempts were made to spirit away their babies.

Early in life, Algie's inquisitiveness and audacity began to show. Following the example of his older playmates, he allowed himself to be stroked by a human hand, and he even enjoyed having his belly tickled. When about a year old, he was making jumps out of the water to take fish from the attendant's mouth, a feat that some of the adult porpoises have never under-

taken. By the time of his first birthday, two other male porpoises had been born in the tank. Before his second birthday, Algie had become the mainspring of the trio and the prime mover of most of the activities pictured in these pages. However, it was inevitable that some of his activities would be met with a rebuff from his elders. As a result, Algie bore more cuts, abrasions, and tooth marks than any other porpoise in the tank.

Porpoises are naturally vigorous, powerful, alert, and inquisitive animals. In the tank they are constantly in motion. They slow down their pace only when tired and sleepy, but even then they maintain their regulated, rhythmic swimming movements. Being well adapted to the medium in which they live, they are fast and expert swimmers. Their ability to start suddenly from a dead stop as if shot from a catapult, and the ease with which they execute sharp turns or abrupt stops, is indeed amazing.

A great deal of their activity, particularly that of the younger ones, is devoted to play. They may be seen playing by themselves, with one another, in a group consisting of a few individuals, and even with the visitors or the Studio's personnel at the railing. They will play "fetch," recovering small inflated inner tubes tossed out to them or even shells that are to be found on the bottom of the oceanarium.

► PORPOISES, like all other animals, need sleep. In the tanks, they take catnaps between feeding shows or in the early hours, swimming slowly with eyes partly or completely closed. Even when sleeping, they rise periodically to breathe



► **PLAYING** with a fish. This sea drum may appear to be in difficulty, but he has lived with the porpoises in the same tank for three years

The most remarkable thing is that they play without any expectation of reward, simply for the pleasure of it. What's more, the porpoises compete among themselves for the object and for the distinction of being the retriever. When being petted from a small platform overhanging the water, the young porpoises actually vie for the privilege, pushing, crowding, and biting one another out of the way. At feeding time, one of the younger porpoises will sometimes outleap others and obtain a fish only to release it in the water and jump again, exerting himself thus for the sheer sport of it.

On several occasions some of the porpoises were noticed balancing a shell or a small flat piece of coquina rock on their snouts. They would skillfully carry the object to the surface, allow it to sink some distance, and then quickly recover it again before it had reached the bottom. To encourage this form of play, several colored plastic disks about six inches in diameter were dropped into the tank. Within a matter of minutes, the porpoises had examined them closely and put them to the use for which they were intended. Even the dignified old bull, who rarely engages in games, expertly balanced a disk on his snout and competed for it with the other porpoises.

The fishes occupying the tank with the porpoises are probably their most natural and popular objects of play. Strange as it must appear to many, the porpoises rarely eat any of the smaller fishes in the tank, because it is so much easier to eat the ones that are handed out to them in generous and satisfying amounts. Instead of eating the live fish, they prefer to play with them. Once having satisfied his hunger, a young porpoise may be seen releasing a food fish from his mouth among a group of

small fishes and then swimming away. This is deception of the first order, for no sooner have the hungry fishes started nibbling at it than the porpoise abruptly darts back, putting them to flight. He regains the bait only to release it once again. This teasing is repeated half a dozen times until the morsel is worn thin. At no time during this game is an attempt made to catch a live fish, even though some may be within his reach.

The young porpoises are often seen chasing small fishes in and out of the crannies around the rock formations, and they are particularly attracted to swifter fishes, such as tarpon or rudder fish. These fishes afford them greater opportunity for rapid movement and pursuit. If for some reason a fish refuses to swim, the porpoises begin to nudge it with their snouts or nip its tail, trying to make it swim faster. Sting rays, small nurse sharks, sea drums, groupers, and other large specimens, including large sea turtles, have been buffeted and pushed around in the tank intermittently, day after day. This intensive play seems to reflect a surplus of energy, which must be expended in one way or another. In the case of younger animals, it may serve as training for future encounters with real enemies.

Mating takes place in the spring, when animals of both sexes become extremely restless and engage in courtship. The wooing is not restricted to either sex but is rather subject to a given situation. In the past when the tank was populated with several adult males, they competed and fought among themselves over a receptive female. Now, since the adult male population in the tank has been reduced to a single bull porpoise, it is the females who tend to vie with one another for the bull's attention. However, it is not to be understood that this mating pattern is a rigid one. In fact, in the latter instance, it is usually the bull porpoise who determines the choice of his mate.

During these periods of excitation, the bull porpoise emits a distinctive yelping sound which seems to be directed at a certain female, and apparently it is this animal that responds to the call. Consequently this yelping sound has been termed the mating call. As the porpoises become stimulated by the courtship, their swimming movements, accompanied by leaps out of the water, become so rapid and intricate that the identification of the individuals becomes very difficult at times.

The porpoises possess a keen sense of hearing and are therefore



very sensitive to all water-borne sounds. They can also see well in and out of water. The captured porpoises, and to a lesser degree the porpoises born in the tank, have retained their sense of caution and alertness so characteristic of most wild animals. It is not surprising, therefore, that they should react instantly to unusual noises or to the sudden appearance of new objects in the tank. In the wild, most animals when frightened resort to flight. In the tank, the porpoises display a similar reaction. When disturbed, they tend to school immediately and begin to swim at an accelerated pace away from the source of disturbance. They continue thus on the alert, craning their necks and eyeing the object critically, until they have become satisfied that their safety is not threatened. Then they gradually relax, break up the formation, and resume their normal behavior.

It might be of interest to note that on occasion porpoises make a

show of fright at an insignificant object. These disturbances are usually shortlived and are thought to be connected with the animals' inability to satisfy the impulse to run away.*

Recently, when a five-foot shark was introduced into the tank, the porpoises, whistling loudly, schooled immediately and exhibited a typical fright reaction. The shark remained practically motionless and did not show any aggressive intentions, so the porpoises gradually began to slacken their movement. Suddenly two or three young porpoises broke away from the school, swooped down over the shark to examine it at close range, and then made a couple of tight quick circles around the fish almost touching it, causing it to twirl in the same direction. Just as abruptly they rejoined the school. This maneuver went on intermittently for half an hour or so. In the meantime, the older porpoises had regained their

*Hediger: *Wild Animals in Captivity*, 1950.

dignity, and one or two were taking a nap. Several hours later, a single young porpoise would dash down over the shark and tug with his mouth at its pointed tail. In another day or two, the shark's presence was practically ignored.

However, it is not to be construed that the porpoises are not capable of taking the offensive when need be. In fact, there are several cases on record of porpoises attacking and even destroying adversaries whose presence in the same tank they either resented or considered dangerous. On different occasions, sharks and a pilot whale have been attacked, thrashed, and injured—seriously enough in some instances to cause their subsequent death. One such attack, as described by an attendant, occurred during the early hours of the morning, when three adult male porpoises ganged up on a very large sand-bar shark. The assault culminated with a mortal blow that one of the porpoises delivered by ramming his snout into the region of the shark's gills. It came with such terrific force that it threw the shark bodily against the wall of the tank. The shark sank and died almost at once. On another occasion, a young pilot whale was also attacked and injured during the porpoises' mating season. Later in the year, after a second attack, the whale stopped eating and subsequently died. An autopsy showed that he had suffered a broken jaw.

Divers, on the other hand, have entered the tank with complete impunity year after year. They usually carry with them a basketful of fish to feed to the porpoises. Sometimes a porpoise, in his anxiety to get a fish and not realizing his bulk and weight, sends a diver sprawling to the floor.

Divers also enter the oceanarium

◀ THE PORPOISES make things difficult for the diver when he comes to clean the tank instead of to feed them. They swoop close over his air hose and catch it with the tail or flipper and carry it some distance away





▲ SIX PORPOISES breaking the surface to breathe. Normally they do this from one to three times a minute, but when necessary, the Bottle-nosed Dolphin can remain under water for six or seven minutes

to clean the ports and to attend to other chores. On these occasions, the porpoises, well knowing that no fish are being brought for them, amuse themselves by getting hold of the diver's air hose with one of their flippers or with their flukes and commence to swim away with it. This sort of activity has sometimes proved embarrassing. Recently a diver popped up to the surface like a cork—minus his helmet.

Although it is not generally known, porpoises emit a number of different sounds. Most of these sounds, which can be heard plainly by the human ear in the corridors or above decks at Marineland, are whistles, groans, squeals, and other hard-to-describe "vocalizations." There is little doubt that some of them represent a form of communication between the porpoises and an expression of their feelings. They emit a variety of sounds when a basket of food fish is lowered into the water. They whistle excitedly when courting one another; and a mother recalls a straying baby to her side or warns the baby of danger by whistling. The fact that

a baby porpoise responds to a mother's call or vice versa, or that a certain female porpoise may respond to the bull's call, would seem to indicate that the various individuals may have distinctive notes, which each porpoise can readily recognize.

So as to learn more about these interesting underwater sounds at Marine Studios, a specially constructed hydrophone was suspended in the water, and sounds ordinarily inaudible to the human ear were successfully recorded on tape. However, the porpoises, after due examination, decided to make a toy of the hydrophone by whacking their flukes hard against it. Thereupon,

▼ THE PORPOISE hears through two small openings just behind the eyes, leading to the hearing organs. This young porpoise is inquisitively viewing the hydrophone, placed in the tank to study porpoise noises



the hydrophone was moved to the floor of the oceanarium, where it now rests under a pile of heavy rocks. Just for certainty, the connecting cable was spiked to the wall!

At the present time the porpoise colony on exhibit consists of fourteen animals. These include one adult bull porpoise, four adult females, and seven young. They belong to the species known as Bottle-nosed Dolphins (*Tursiops truncatus*). In addition, there are now in the tank two male Long-snouted (or Spotted) Dolphins (*Stenella plagiodon*). Animals of both species associate with one another freely.

The seven young porpoises were all born in the tank and range from a few weeks to six years in age. One aspect of parent-filial behavior is particularly impressive. While there is naturally a close bond between the baby and the mother during the early days, this association persists beyond the nursing period and may exist for years. This has been demonstrated by "Spray," now six years old, and "Algie," who is about four years old. Both of these animals, as well as the younger offspring, still seek their mother's company when tired, sleepy, or alarmed. Similarly the mother porpoises are often seen playing with their offspring, regardless of their age.

The bull porpoise, who is the largest animal in the colony, is generally inoffensive despite the superiority of his great strength. However, he will waste no time in making his displeasure known. More often than not, the offender may have snatched a fish from under his nose or, worse yet, objected to his advances. At such times, the bull asserts his dominance in a most definite manner. The mighty clap of his jaws resounds through the tank and can be heard plainly in the corridors as he makes a rush for the culprit. In the ensuing race, the bull skillfully maneuvers his way through the tank, attempting to overtake and chastise the offender. As the



▲ AN OLD FRIEND to readers of NATURAL HISTORY. Flippy, the first educated porpoise, with Pat, his trainer's assistant. The whitish area around his blowhole is petroleum jelly, put there to prevent sunburn

animals achieve excessive speed, their skin tends to become noticeably wrinkled. The bull usually succeeds in heading off the fleeing animal by cutting short across the tank.

Whenever such disturbances occur, all other porpoises become alarmed and subdued, and the young ones immediately pair with their mothers and commence swimming rapidly away from the bull until peace is restored again. It is mainly as a result of the bull's outbursts of anger that some of the porpoises bear tooth marks on various parts of their bodies. The tail seems to be particularly vulnerable to attacks, and the tooth marks are especially conspicuous on the younger animals. Fortunately they are never of a serious nature.

The porpoises' skin is smooth and rubber-like, and like most animals, they like to scratch themselves. In the process, they sometimes upset the rock formations that serve as a refuge for small fishes. So the porpoises have been supplied with a few street cleaner's brushes, anchored to heavy rocks on the floor of the oceanarium. The porpoises weren't long in recognizing the utility of these. Now they scratch their bellies, backs, necks, and the tips of their snouts with expert precision.

At present, all of the porpoises give every appearance of good health and well-being. In the past, they have mated and reproduced, and the offspring have grown to be healthy, normal animals in every respect. We hope to learn more as time goes on.



Hydra

Catches a Waterflea

➤ HYDRA is a lazy animal that moves with difficulty and only when it feels there must be a better fishing ground someplace else. Most of the time it hangs in the water, waiting and waiting

An animal that is scarcely more than a hollow tube captures an animal that has a brain

By ERIC V. GRAVE

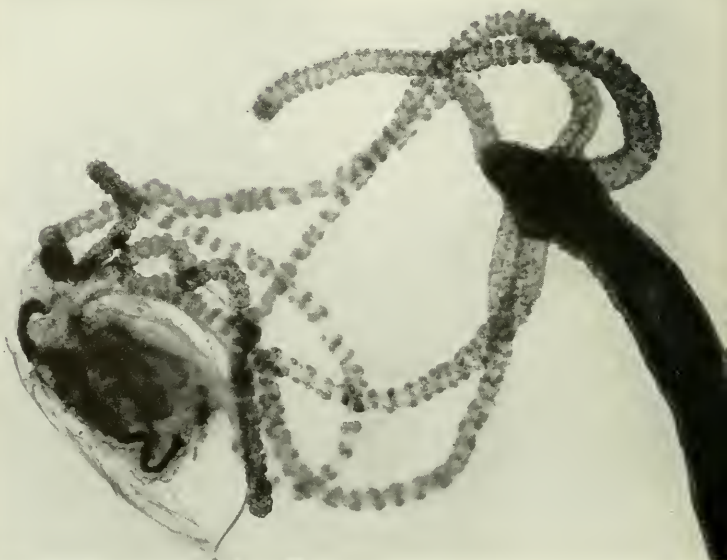


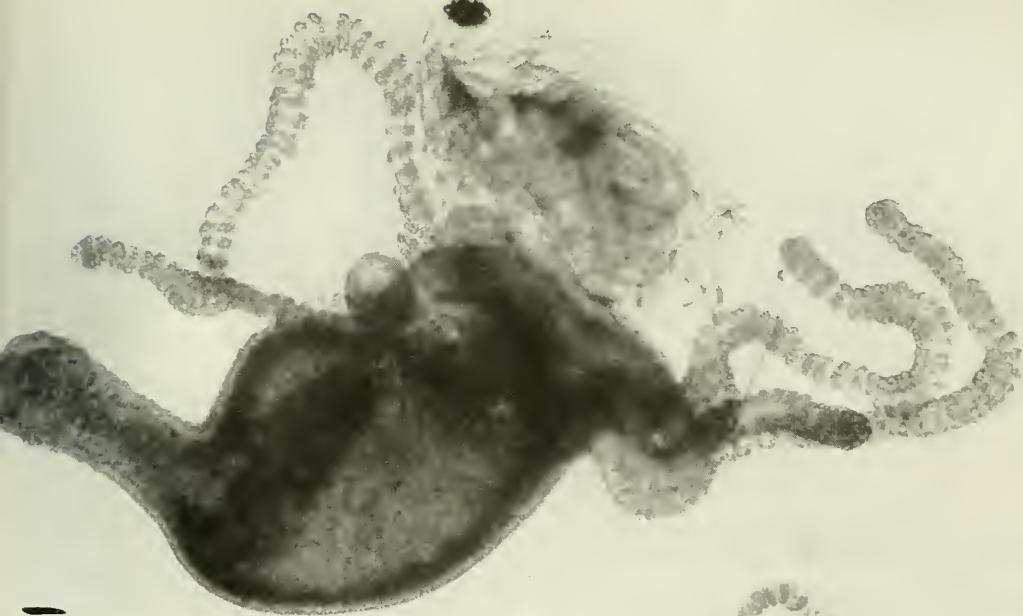
THE Hydra is a little animal that lives in ponds and lakes, attached to some water plant. That its body is at times long and at times drawn up short impressed Anthony van Leeuwenhoek, who was the first to observe the creature through the microscope. Despite its remarkable ability to contract and expand, it is a simple animal as far as structure goes, consisting of not much more than a hollow tube, which is closed on one end and open on the other. The open end is the mouth and anus at the same time; whatever can not be digested goes out the same way. Around the mouth several tentacles are arranged, formidable weapons, which serve to catch minute creatures that may happen to touch them.

Hydra has no eyes, nothing that could be called a developed brain, though it has nerve cells, sensitive to outside influences. These nerve cells govern its activities.

▲ ONE of the small creatures that Hydra likes for food is the waterflea, *Daphnia*, shown here. *Daphnia* is a much more highly organized animal. It has well-developed internal organs—a heart, a compound eye with about 20 lenses, and a brain. It also has a digestive tract where food gets in at one end and leaves at the other. Two strong antennae enable it to swim about happily in the water, jumping up and down without ever stopping. But...

➤ . . . the moment it accidentally touches one of Hydra's tentacles, its fate is sealed. These tentacles are set with netting capsules, which discharge a poison that paralyzes the victim within a few seconds. For the waterflea in this picture there is no escape





▲ HYDRA'S MOUTH opens around the paralyzed waterflea

➤ THE WATERFLEA has almost disappeared

▼ NOW it is devoured. Daphnia's eye and the outline of its body can still be seen through the transparent belly of the Hydra

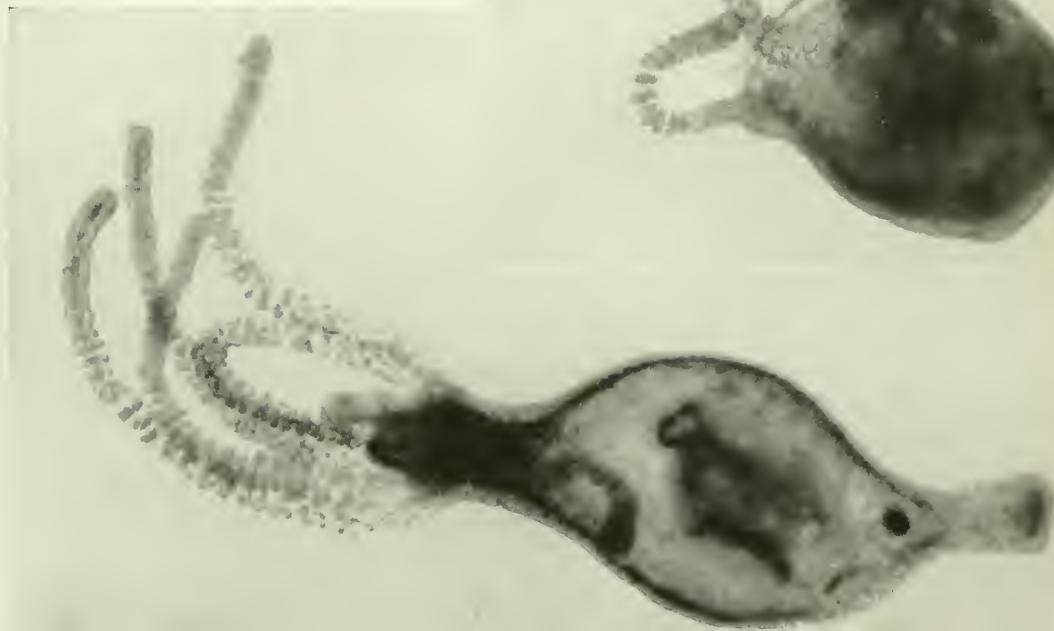


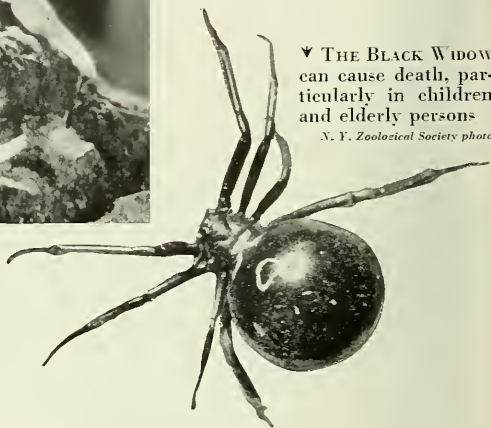


Photo by Billy Jones from National Audubon Society

◀ MOST SCORPIONS' stings are no worse than a wasp's. But deadly ones do exist in Arizona

▼ THE BLACK WIDOW can cause death, particularly in children and elderly persons

N. Y. Zoological Society photo



Harmless or DEADLY?

Clearing up some erroneous ideas about animals and describing the actions of some of the most unusual killers in the animal kingdom

By OSMOND P. BRELAND
University of Texas

EVERYONE knows that such animals as lions, tigers, crocodiles, and venomous snakes can be dangerous to human life. It is also well known that bacteria and other disease-causing organisms take their toll of the living. But there are many creatures in the animal kingdom with deadly powers about which the average person knows little. Some of these are likely to be met only by especially adventurous souls whose ways of life carry them far from the usual haunts of man. Others can be encountered by people who live the most humdrum existences.

Most of these unique killers of men are dependent for their ill effects upon the use of a venom or poison. We are all aware that the effects of various diseases vary from person to person. Some individuals will have a very mild case, others

a severe one. This may also be true of the reactions of human beings to venoms. However, the amount of poison and the treatment given the victim are probably more important. It might be remembered, however, that even the supposedly least dangerous biting or stinging creature may occasionally cause trouble in an especially sensitive individual.

Few who swim regularly in the ocean are not acquainted with certain jellyfish, which in parts of the Gulf Coast are called cabbage-heads. They enjoy many other less complimentary names. Many swimmers have had quite painful contact with them. These jellyfish have many small stinging cells on their tentacles, which penetrate the skin and cause an intense burning sensation that may persist for many hours. The stings of these small jellyfish, while earning the creatures

respect, are normally not dangerous to human life. But larger specimens present an entirely different proposition. Some of these creatures may be 7 to 8 feet in diameter, with trailing arms or tentacles more than 100 feet long! There are millions of stinging cells on the tentacles, and woe betide the swimmer, fish or human, that becomes entangled in their embrace.

One of the most dangerous animals in this category is the Portuguese man-of-war. A gas-filled bag or float extends several inches above the surface of the water, and the creature is carried from place to place at the whim of wind and waves. The Portuguese man-of-war is really a beautiful thing, with iridescent blue or orange-colored tints that shimmer in the sunlight. But one must not forget the death-dealing tentacles trailing out of sight



Ewing Galloway photo

▲ THE DANGER of octopuses is generally exaggerated. However, newspaper accounts have recently described two cases within two weeks of each other in which swimmers in Australia escaped only with difficulty

in the water below. They have been known to overcome and consume a full-grown mackerel and to cause death to adult human beings.

A person tangling with a large jellyfish is stricken with intense cramps and develops difficulty in breathing. If this happens in deep water, the victim is quite likely to be overcome and to drown before he can be rescued. At least two reasonably authentic cases of death from this cause have been reported from the Philippine Islands over a period of years, while the life of another man in Puerto Rico was saved only by a quick rescue and prompt medical attention. It is in-

deed a wise swimmer who decides that he has business elsewhere the moment he finds himself in the vicinity of a Portuguese man-of-war.

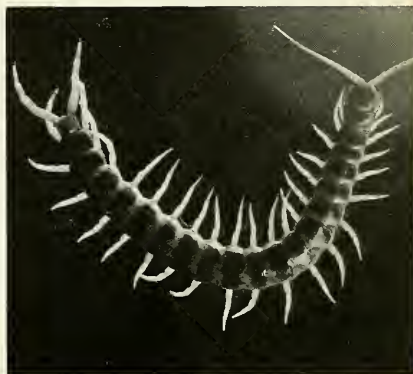
The sea-wasps (Carybdeidae), though less well known, are also quite dangerous. It may be some comfort to know that these "monster" jellyfish seem to be found only in the arctic.

Snails certainly do not appear dangerous as they creep slowly along on their bellies, leaving a trail of slime behind them. But there are many different kinds of snails, not only in ponds and streams but in the ocean. Some of the marine forms are called cones or cone shells



N. Y. Zoological Society photo

▲ AFRICAN SCORPION FISH, equipped with spines connected to poison glands. A beautiful fish but dangerous



N. Y. Zoological Society photo

▲ SOME CENTIPEDES, like this seven-inch one from Colombia, have poisonous bites, but no deaths are known

because their shells are cone-shaped. The shells are usually two to four inches long and are prettily colored with light and dark splotches. Many are in demand by shell collectors, but living cone snails had best be collected with care. The bite of some species is as deadly as that of a venomous snake! You may be surprised that I use the word "bite"; but the term is quite proper, for the action is in some ways comparable to the bite of a snake. I am informed that the venom of the larger species is certainly very dangerous and that well-documented instances of fatalities have been reported from the

bites of snails whose shells were from four to six inches long.

The particular kinds of cones that are venomous are not well known. Most cases of severe injury and death have been reported from western Pacific islands. Dr. William Clench of Harvard University lists Fiji, Samoa, New Guinea, New Caledonia, Tonga, New Britain, and the Society and Caroline Islands as being included in the area of known danger. Until more specific information is available about these reprobates of the snail clan, all living cone shells should be handled with extreme caution.

Some time ago, a biologist, supposedly wise in the ways of octopuses or devilfishes, stated that a person is more likely to be attacked by a pumpkin than by one of these creatures. Perhaps the authority had recently been the victim of a successful pumpkin bombardment and had thus come to regard them as dangerous vegetables. However, evidence indicates that the statement is somewhat exaggerated. Equally absurd, however, is the notion that devilfishes spend most of their time looking for a man to

eat. The truth of the matter seems to lie between these extremes. No authentic case of death from octopus attack has been discovered; but that the creature can be potentially dangerous is supported by two newspaper clippings recently received from Mr. Maynard E. Macdougall, of Australia. Two attacks by octopuses in Australian waters, occurring within two weeks of each other, are described by eye witnesses. In both cases, the divers escaped only after a considerable struggle. Possibly the episodes were exaggerated, but I can see no reason to dismiss the accounts as complete fabrications.

If there are still a few doubting Thomases who do not believe that sharks are dangerous, we should repeat that occasional attacks on swimmers, by certain kinds at least, are well established. Almost any shark may snap at you if you corner him and bother him. He will lash with his tail as he goes out of his corner, and the spines in his skin will take the skin right off a swimmer. But the white shark, or man-eater, seems to be the main one that actually attacks man. There have

been more attacks in southeastern Australia than in the rest of the world put together.

Not so well established, perhaps, are deaths of human beings from certain fishes with venomous spines. The best-known stinging fishes are the sting rays or stringarees, the weever, and the scorpion fish. Of these, the stingaree is best known to the average person. The stingarees are greatly flattened fishes, and the barbed stinger is near the base of a long slender tail. Most of them live in the ocean, but a few are found in fresh water in the rivers of South America. These creatures often lie in shallow water, partly buried in the sand. If you step unceremoniously in the middle of a stingaree's back, it will usually retaliate by burying its stinger as deeply as possible in the offending foot or leg.

It is well known that such an injury is excruciatingly painful and that its effects may persist for weeks or even months. Not so well known is the fact that certain tropical species may actually cause death. The South American freshwater species are probably about



N. Y. Zoological Society photo

▲ THE SKIN secretion of the neotropical toad, *Bufo marinus*, is extremely poisonous. Better not touch it

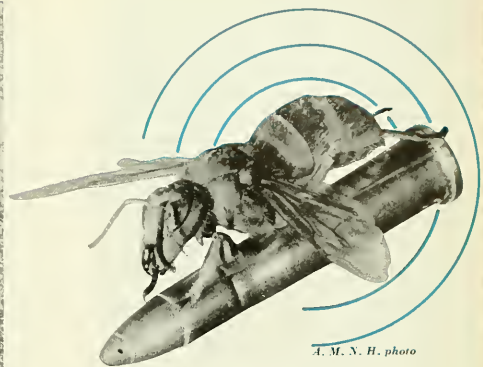


A. M. N. H. photo

➤ THE RELATED TOAD, *Bufo alvarius*, has caused the death of dogs who carried it in their mouths



N. I. Zoological Society photo



A. M. N. H. photo

↑ THE DANGER from hornets is through the remote possibility of an allergic reaction

← TARANTULAS are less dangerous than popularly supposed

as dangerous as any. The early South American explorer Richard Schomburgk saw a native die as a result of a stingaree's sting, and other deaths have also been reported. A large marine sting ray, found in the Australian area, is also said to cause death occasionally.

Weever fishes and scorpion fishes, of which there are about 40 species, live only in the ocean. Their weapons are in the form of grooved or sometimes hollow spines connected to poison glands. Many of these spines are in the fins that extend along the middle of the fish's back. Weever fishes are not unlike the usual fish in general appearance, but it is hard to imagine a fish uglier than some of the scorpion fishes. These finny freaks have a hideous mouth and a body studded with warts. They spend much of their time squatting on the bottom, often in cracks and crevices among rocks. Dr. H. Muir Evans, English physician and biologist, had a patient who died from the sting of a weever fish. He has also collected and reported several additional cases of death caused by weever and scorpion fishes. He states that the scorpion fish's sting is especially painful and that people who are stung often become delirious with such intense pain that the victim

may insist that the injured part be cut off! Weever fishes are sometimes caught in nets, and fishermen have been stung when carelessly trying to remove them.

A few fishes generate a strong electric current, which they use in their defense, and some of these are certainly potentially dangerous. The largest of these electric fishes, the electric eel of South America and the so-called torpedo, can generate enough current to knock a man flat on his face. Torpedoes are related to stingarees, and they are flattened fish that lie on the bottom and grub around in the mud for food. They all live in the ocean, and large specimens may be three feet wide. The South American electric eel may attain a length of more than eight feet, and it is probably even more dangerous than the torpedo. Specific instances of death from either of these fishes have not been noted. But instances are on record of victims having been knocked unconscious and saved from drowning only by prompt rescue.

We should not leave the finny tribe before pointing out that at least 100 fishes have flesh that is poisonous to eat, and some reports list close to 300. Almost all are salt-water fishes of tropic seas (usually

near corals), and we can say that over 50 are *always* dangerous to eat. Alas, most of them cannot be easily recognized. Many, if not most, resemble good food fishes. The tropical puffers are among the fishes having the most poisonous flesh. Instead of regular teeth, they have beaklike structures. Their scales are absent or reduced to spinules, though in the case of porcupine fishes, they have become huge spines. The habit of puffers to blow up with water or air when disturbed makes them easy to identify. The greatest number of fishes that are dangerous to eat live in the Pacific, but puffers are widespread, and deaths have been reported from many parts of the world. Cooking does not make poisonous fishes safe to eat.

The notion has been entertained by some that a South American toad has a bite so venomous that it could kill a horse. This belief was probably based upon the reports of a famous naturalist who made this claim. These creatures are called horned frogs or horned toads, and they are so large that a good-sized specimen would almost fill a plate. It is now known that these toads are not poisonous, but they are quite pugnacious and will bite viciously on the least provoca-

◀ THE TENTACLES of the Portuguese man-of-war carry stinging cells. Large jellyfish caused two deaths in the Philippines

A. M. N. H. photo

tion. Once their jaws have closed on an object, they hang on so tightly that it is almost impossible to break the grip without killing the creature.

So far as known there is no amphibian—the group that includes frogs, toads, and salamanders—that has a venomous bite. But many of these creatures have poison glands in their skins. This poison is so potent in some species that a person's hands will be irritated if they touch the material. A South American tree frog, *Dendrobates*, once had the reputation of possessing the most powerful poison. But despite its alleged use by the natives for tipping poison arrows, actual experiments by Dr. E. R. Dunn demonstrated that the secretions were incapable of killing even small animals. On the other hand, it has been established that the secretions of the neotropical toad, *Bufo marinus*, is extremely poisonous. And a related toad, *Bufo alvarius*, has caused the death of dogs who merely carried the creature in their mouths. Further, extracts from the skin of the Pacific Coast newt have yielded a poison shown to be very strong. But present information does not permit us to say which amphibian has the most potent venom.

Turning to the creatures that are often called "bugs," we find several representatives that can qualify as dealers of death to human beings. The most notorious of these are the spiders, scorpions, and centipedes. Most persons know less than they think they do about which are really dangerous and which are not. Fortunately, considerable information is available, though much of it is buried in technical publications. Medical case histories of hospitals and physicians have provided some of our knowledge. Additional

information has been obtained from scientists who have allowed these creatures to bite them so they could study the effects of the venom on themselves!

Many people are intensely afraid of all spiders. Actually there are not many that are dangerous to human life, although the bites of several may cause local pain. The two spiders in the United States with the most evil reputation are the black widow and the tarantulas. As for the big, hairy, fearsome-looking tarantulas, a bite from one of them has never, so far as is known, caused death to a human being. People who have been bitten describe the effects as being comparable to those suffered from a bee sting.

But the black widow is a different matter, and there have been authentic cases of death from the bite of this spider. Black widow spiders have been reported from all the states of the United States, and their relatives, most of which are dangerous, occur in many other parts of the world. Old people and young children are most likely to die from the bite, but even healthy young adults must look upon these creatures with respect. Some years ago, an interesting book was published entitled *Black Widow*, in which 1291 reported cases of black widow bite in the United States were listed; 55 of these were fatal. Authorities now suspect, however, that many of the recorded deaths should really be ascribed to other causes and that death directly from black widow bite is a very rare occurrence.

The black widow spider is easy to identify. It is of medium size with a coal-black body and a red or orange spot on its tummy shaped like an hourglass. It builds its web under rocks and in piles of wood, and it may sometimes be found in outhouses. It is not an aggressive creature, and most of its bites occur when a person accidentally bumps into the web. The spider feels the web vibrate, rushes out to capture an insect, and bites the first thing it encounters. The list mentioned

above covered more than 200 years of reported bites, which in itself indicates that they are relatively rare. Doctors know an excellent treatment for the bite (injection of calcium gluconate), which usually relieves the pain within a short time and minimizes the chances of death.

There is also a spider in Australia whose bite has been known to cause death. This is a large black species called a funnel-web spider. Keith McKeown, Australian entomologist, and others have reported several fatal cases. One or two other spiders in South America and certain other areas are rated dangerous by some scientists. But even on a worldwide basis, the number of spiders that are dangerous to human life is very small as compared to the number of kinds of spiders known.

The stinging apparatus of a scorpion is at the end of its elongated abdomen or tail. The scorpion uses it to kill insects for food, and with proper provocation, the creature is not adverse to testing its penetrating weapon on human anatomy. The most feared scorpion in the Western Hemisphere is the infamous Durango scorpion found in the state of Durango, Mexico, and adjacent areas. Its evil reputation is well earned. A young, healthy, grown person has been known to die within less than an hour from the sting of one of these scorpions. Approximately 1600 deaths in Durango over a period of some 35 years have been ascribed to these creatures. A good antivenin has now been developed that has greatly reduced the mortality rate. Dangerous species of scorpions also occur in Trinidad, North Africa, Malaya, India, and other tropical regions. One of the most dangerous is an Egyptian form, which is reported to have a mortality of over 50 per cent among young children.

Southern Arizona is the only region in the United States where deadly scorpions can be encountered in normal routine. Here some two dozen deaths have been recorded; all the victims were young children. These scorpions are relatives

of the still more deadly Durango species, and we can be thankful that the creatures have not spread throughout the country. The sting of most scorpions in the United States is usually no more serious than that of a bee or wasp. Yet, in 1945 a man in central Texas was killed by a scorpion sting. He was attended by a reputable physician, and there is no reason to doubt this report. This man must have been especially susceptible to the venom, and the case illustrates the dangers of minimizing the possible effects of even supposedly harmless species.

Centipedes are long, many-legged creatures that run with considerable rapidity. Under the head is a pair of strong jaws connected with poison glands. Tropical species are said sometimes to exceed a foot in length, and in the southwestern United States there is a big blue fellow with yellow legs and an orange-colored head that perhaps rarely attains a length of 8 inches. There are probably more old wives' tales about centipedes than about any of the other creatures we have discussed. Favorite ones include the belief that the bite is invariably fatal and the report that the flesh will drop from the spot over which a centipede crawled. The interesting situation is that *there has never been an authentic case of death from centipede bite!* The bite of some species is painful, and there are some reports of hospitalization, but established fatalities are conspicuously absent.

Many bites and stings from spiders, centipedes, and scorpions occur when the creatures creep into shoes and clothing that are not being worn. It is indeed a wise man in tropical and subtropical areas who develops the habit of thoroughly shaking his shoes and clothing before putting them on.

A consideration of creatures that bite and sting would hardly be complete without a brief reference to a few stinging insects such as ants, bees, and wasps. Some authorities have estimated that it would require approximately 500

honeybee stings to cause death to a person not especially susceptible to the venom. But some people are far more sensitive than this. In fact, instances are known of death from a single honeybee sting. This is the result of an allergic reaction and is exceedingly rare. A particularly potent hornet hails from Thailand and adjacent regions. One physician states that a patient of his collapsed from three stings, and five stings are said to be usually fatal.

The lethal properties of a marching horde of African army ants are well known. When native villages are invaded, the inhabitants simply move out until the ants have cleaned out the vermin population and gone elsewhere. Many ants have very painful bites and stings, but first place should probably be awarded to a large black fellow, an inch and a half long, found in Central and South America. These insects are quite pugnacious and not at all hesitant about attacking anything that disturbs them, no matter how large. A friend of mine, an expert on ants, by the way, once dug into a nest to capture some of these ants for study. He must have become so enthusiastic in his work that he forgot caution for a moment, because one ant managed to elude his grasp and stung him on the knee. The results were excruciating pain, some nausea, and an ulcer as large as the end of the thumb. It was several weeks before the victim had fully recovered. Deaths from the stings of these ants have not been noted, but in a person especially sensitive to the venom, the results could be quite serious and possibly fatal.

When we put all the poisonous animals together, they seem like a lot, but in comparison with the ones that are harmless they are really very few. Many persons do not encounter a single dangerous creature in their whole life. And to know something about the ones to avoid is to enjoy the world of nature to the full and without danger.

* * *

For some of the information contained in this article, the author is especially indebted to John C. Armstrong, C. M. Bogert, Eugene Clark, Willis J. Gertsch, and Eugene W. Gudger.



Assignment

Amazon

A journey
to a distant yesterday
with the Indians
of the Upper Xingu

By
EDWARD WEYER, JR.
Editor, Natural History

All photographs by the author

▲ CAMAYURAS with whom the author traveled
near the geographical center of South America

▼ LOADING the canoes for the journey at Jacaré





▲ ONE of the bark canoes on the Kuluene River. The thick bark is taken off of the *jatobá* tree in a single piece and shaped at each end while soft

IN THE PRECEDING INSTALLMENT:

The author's effort to find and interview an explorer living in the heart of South America was interrupted by a meeting with Chavante Indians who had not had previous contact with civilization. He has now proceeded to the far side of the Chavante territory and is approaching the region where he hopes to find Orlando Vilas Boas.

Part II:

I WAS never gladder that I had studied Portuguese than when our plane came in for a landing on the narrow air strip at Jacaré. The moment the wheels touched the ground, the pilot, sitting next to me, began shouting orders, because our brakes had failed completely and he needed help in bringing the plane in. As we sped toward the end of the clearing, he swung the tail back and forth trying to slow us down, while I, following his instructions, strove to hold the tail down with the stabilizer. We ran off into the rough and stopped just short of the forest.

The pilot ran a handkerchief across his forehead, and I began to realize that only his skillful handling had saved us from a smash. Jacaré is in latitude 12° 0' S. and longitude 53° 34' W. in the headwaters of the Xingu River, a large stream flowing northward into the Amazon from the center of South America.

Five weeks had passed since my arrival in Brazil, but at last I had reached the outpost from which I thought I could find Orlando Vilas Boas, the almost legendary character whose humanitarian work among the Indians I thought might

deserve wider publicity than it had received. I was in for disappointing news within two minutes after my arrival.

We taxied toward some thatched huts that were visible on one side of the strip, and a dozen or so naked Indians from the village that was only a few hundred yards away swarmed around the plane. Orlando Vilas Boas, I now learned, had passed through here only the day before on a two or three weeks' trip down the Xingu River.

I was disheartened that the man I had traveled six thousand miles to see should have escaped me by only a few hours. I could not catch up with him, and my time was running short. This was what people in Rio had warned me—that Orlando moved over a large area of wild territory and might be very hard to find. Yet I was not ready to relax my effort. In fact, the various setbacks I had already suffered only made it more difficult to think of giving up.

The Indian village here was interesting though small; and there was nothing lacking in the hospitality of Senhor Alencar, who lived in a near-by hut with his family and was in charge of the air strip.

But I was strongly drawn in another direction. I had an invitation to join a band of traveling Camayuras and go with them to their village. One of them, the son of a chief, spoke a little Portuguese. I could not communicate with the others. There were ten or twelve of them, wild muscular-looking men in their prime. Some wore necklaces of jaguar teeth or shell beads and red and yellow feather earplugs. They wore nothing else except a string of beads around their waists. Each carried a hammock, a bow, and arrows. A green parrot rode on the shoulders of one.

"There will be dancing and singing when we get to our village," said the chief's son. "And you can trade for the things we make."

"How far is it?" I asked, recalling how people had warned me that the Indians would steal whatever they could from a traveler.

He seemed vague. "Not far," he said.

He could not locate his village on a large-scale map I had. He thought perhaps it was off the edge. He was uncertain about the direction. This troubled me.

"Is there water near your village?" I was wondering how far I might have to go to get drinking water and whether I would have to boil it or use more of my tablets to purify it. Also my clothes were dirty, and I wanted to wash them.

"Our village is on a beautiful lake. Swimming all the time."

I do not believe that explorers



▲ WHILE PADDLING close to shore, one of the boatmen is usually ready to shoot a fish with bow and arrow

➤ BOWS AND ARROWS, flutes, hammocks, and white pancakes of manioc flour comprise the usual light baggage of the Camayuras. Note also the customary parrot



should ordinarily travel alone. An accident, an attack of appendicitis, or the hostility of natives can quickly become serious. I had not made the acquaintance of the chief. On the other hand, I longed to study the life of these natives in the raw, as it were, without the distracting influences of a large expedition. And I felt drawn to these people.

I know of no better guide in a situation like this than a sort of intuitive sense of trust. I don't think that truly natural natives like these could fool you into liking them if they were plotting against you.

"I accept your invitation," I said, and we left the next morning at sunup in three canoes.

There was no talk about payment, though I could scarcely be called an easy load. I had 175 pounds of equipment and supplies, in addition to my hammock, canoe paddle, machete, and bow and arrows. I carried no firearms, and I doubt that the Indians would have been as glad to have me if I had.

Down the Jacaré (Alligator) River and up the Kuluene we paddled to the music of flutes! Here was a scene as far from the sham

of our civilization as one could get. The moviemakers could not have made up anything so lovely and so freely natural. Some of the Indians wore bright feathers in their hair, and the colors of the sunrise lighted the cool mist under the jungle growth of the shores.

As we floated through the opalescent world, lulled by the flute music, I could not keep from picturing the American equivalent—Dad, behind the wheel, pleading for more help with the road signs, Junior and Sister warring over which radio program to play, and Mom trying to close her ears to it all and remember which pieces of clothing she had forgotten to pack.

Sometimes the Indians paddled hard for a spell, racing with one another. Once we stopped to eat papaya and pieces of the large flabby pancakes made from manioc, the tapioca plant.

A short distance up the Kuluene, we edged over to the west bank, where the water was rushing past a 20-foot gap in the shore. Paddling hard, we dodged into this narrow opening and found ourselves in a stream, which widened at first and then narrowed. Here men with bows and arrows stood ready to

shoot fish. The parrot now took a fancy to the top of my head and bit my hand every time I put it near him.

The river ended, and soon we were in a swampy forest, balancing on submerged logs. This was my first visit to the tropics. The black ooze was too deep for my boots, so I went barelegged. The heat was terrific, the footing slippery. I found it difficult to balance my valuable equipment on my head and at the same time swat insects and wonder whether one of the vines I grabbed might turn into a snake. This region has much malaria, but I had been taking aralen as a preventive for many weeks. The trip was nothing at all for the Indians, of course, and I found them edging ahead of me.

"Are we getting there?" I asked Tah-Koo-Mah.

"Not much farther," he answered.

"More than ten minutes or less than ten minutes?" I asked.

He seemed in doubt. "Perhaps less."

There followed a grueling march across a blazing, treeless plain. Three hours after I had last sought information from Tah-Koo-Mah, we were in our third swamp, wading to our thighs in black mud.



◀ THE CAMAYURAS are strong travelers with feet hardened to the trail. But sometimes they stop to remove a thorn or a chigger from their skin. This picture was taken in the forest on the way to Lake Ipavu

▼ THE GOING was difficult through the swamps. The region is malarial but otherwise healthful



"Does the padre from Chavantina get to your village often?" I asked him. Chavantina was 200 miles from here.

"No, he has never been there."

"Who visited your village last?" I asked.

"No one. You are the first white man ever to visit our village," he said.

This was hard to believe. Perhaps if others had made their way through Lake Ipavu, they had done so without stopping at this village.

Be that as it may, I was beginning to think I knew one man who wasn't going to do it again.

The darkness of the jungle did not lighten my mood. I had food for two weeks but was beginning to wonder how I would get back through these swamps if the Indians lost interest in me. It was not a trip one would welcome alone. I simply could not do it with even a fraction of my valuable photographic and recording equipment.



And a boat, or at least a raft, was needed at both ends.

We found a large dugout the Indians had hidden in the swamp. In this we poled and pulled our way along by the hanging vines, and gradually the watery way widened into a small stream, roofed over by trees.

I was really worried by only one thing at this time. I kept recalling how I had been warned that the Indians would steal anything they wanted, and I knew of two recent expeditions that had been left high and dry by their Indian boatmen in another part of South America. However, I had not had the slightest reason to distrust my friends here and I could not help but like them, though Tah-Koo-Mah's father, directly behind me in the canoe, seemed austere.

Suddenly the trees parted, and we found ourselves gliding on the

surface of a smooth, sparkling lake. Around the shore, palm trees nodded in silhouette against the cottony clouds. So peaceful and entrancing a spot I had never seen before. It seemed not to be a part of the world we know. From this moment, I felt that I had reached a hidden corner where Time stood still, a secret Eden infinitely distant in history. Down through the centuries, while civilization rushed onward heavens knows where, human life on the elemental level must have been preserved here as from the early days of our ancestors, unchanged by the slightest echo of what we call progress.

What I did not know at this time was that the bones of another white man lay at the bottom of this lake. So far as I have been able to piece it together, he was a journalist from California. The Indians had murdered him some years

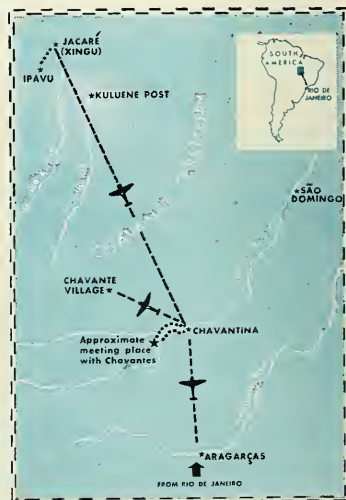
ago at the junction of two rivers a few miles away. When his bones had turned white, they brought them here and dropped them into the lake. I feel quite humble when I think of the journey he made.

He was certainly a courageous man, who made a hazardous trip in-

▼ THE GRASSLANDS of the Upper Xingu are extremely hot at midday but chilly at night



▲ THE AUTHOR carried Flag No. 16 of the Explorers Club





▲ THE VILLAGE on the east bank of Lake Ipavu, in the heart of the Camayura country

to this country from the south in search of Colonel Fawcett and dropped out of sight. It seems clear that he was murdered because he kept asking the Indians what had happened to Colonel Fawcett. They began to fear that he had come to avenge the famous explorer's death, and they killed him before he could do so.

Kalervo Oberg, to whose admirable monograph entitled *Indian Tribes of Northern Mato Grosso* the reader is referred for further information on the natives of this area, refers to this unfortunate American newspaper man as Thomas Winton. Harry Wright, on the other hand, with whose writings on the Fawcett mystery the reader may be familiar, gives his name as Professor Albert Winter. But it is

hard to question the spelling of the Brazilian writer Edmar Moré, who reports having found visiting cards left by Albert de Winton at stopping places earlier on his route.

Weeks later, in another village, I sat next to the Indian who killed this man and saw the Winchester he stole from him. This Indian had just arrived in the encampment where I was, and strangely enough I had stopped myself from taking a motion picture of him as he came down the trail, because even at a distance I did not like his looks. It was the only time I remember withholding my camera for such a reason. When in a few minutes I was informed that he was de Winton's murderer, I had no desire to take a close-up. For one thing, I would not want to expose to white

man's law a man whose crime ought perhaps to be judged by different standards.

When we entered the lake, I could see no signs of a village, and the farther shore looked two or three miles away. We started paddling and poling around the edge, and what happened next left a strong impression on me. I puzzled over it time and again during the following days, groping for an explanation.

You must realize that my attention all during this time never wandered far from my jungle brothers. Not only was I absorbed in the actions of so interesting a group of primitive people, but my safety might depend upon knowing how they felt about me.

The chief, as I have said, had



▲ KOO-YAH-YOO processing manioc, the staple food plant that is poisonous until treated

shown no tendency to "loosen up" with me. Every time I looked at him, his face had a serious expression and his manner was distant. I had begun to worry that he might not be happy over my coming.

We had gone only about one hundred yards around the edge of the lake when I felt myself being stroked on the back. Surprised but eager to return any show of friendship, I twisted around, smiling, and patted him. He was looking at me with a kindly expression, which quite changed his appearance. I spoke out suddenly in English for lack of a tongue that he could understand: "I feel the same way about you," I said, and I could not have meant it more.

I'll never know what caused the chief to show a friendly feeling. It is only a guess, but I cannot help wondering whether he recalled that we were passing over the spot where the bones of the other white man had been dropped in the lake. Perhaps he was reassuring me that although they had killed one, they weren't going to do the same thing to me.

The afternoon sun was dazzling as we made our way around the margin of Lake Ipavu. On the platform at the bow of our dugout stood an Indian like a bronze statue, with bow and arrow poised

▼ NIGHTTIME REVELRIES. There was scarcely a quiet moment during the author's visit



for fish. Brightly colored birds darted among the trees, and there was a leafy odor in the air.

My having had to depend for several weeks on a language entirely new to me had helped to separate me from the thoughts and things of my normal life. I felt that my brain cells had somehow become realigned and that I had acquired a somewhat different self. There was hardly a habit of action or speech upon which I could fall back in these surroundings. The workaday routine of city life had dropped away, and I had entered jungle life thousands of years re-

moved from everything I was familiar with. It was as though I had been whisked back into a world of 10,000 years ago—a reconditioned spirit on vacation from Today.

Presently I was roused by the sound of cheerful voices and the splashing of swimmers. We rounded a point, and there they were!

Almost half the village was in swimming. Neither the men, women, nor children wore any clothing, either in the water or out of it. The men were uniformly lithe and muscular. There was not a thin or a fat person among them. Some of the women, with their long black

hair down their backs, were beautiful. There was not a trace of body hair on anyone, and their skin had the soft luster of satin.

At sight of our canoe, there was a lull in the laughing, and I could see their eyes turn in puzzlement to the white visitor. Several swam toward us to convoy our dugout to a crude dock of palm logs. I don't believe I ever felt so curious about what lay ahead of me as I did at that moment.

The account of Dr. Weyer's visit at the village on Lake Iparu will be published in the next issue of NATURAL HISTORY.

▼ KOO-YAH-YOO IN HER HAMMOCK. During the day, most of the hammocks are taken down, but at night they are hung two or three deep, and it is difficult to find one's way among them in the thatched huts





Flight Secrets

FROM A JUNGLE SEED

A winged cucumber seed seems a curious parent for the supersonic planes, yet it may point the way toward man's mastery of the skies

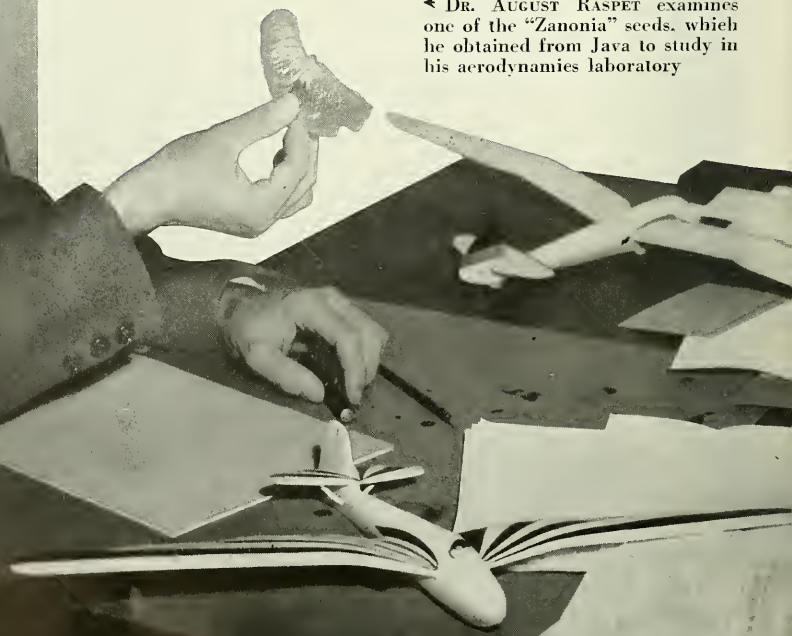
By ROSS E. HUTCHINS

All photographs by the author

IT'S a long way from a cucumber seed to a swept-back supersonic plane. Yet, the two have something in common, and the plane owes a debt to a handful of seeds from the Java jungle. The story begins a long while ago, long before men actually learned to fly and at a time when flight was only a happy dream.

The human part of the story began in 1889, when a German naturalist collected some large winged seeds that he found in Java. He brought them back to Germany, where they excited the interest of Professor F. Ahlborn, who became convinced that these interesting seeds permitted positive lift in inherently stable, gliding flight.

◀ DR. AUGUST RASPET examines one of the "Zanonia" seeds, which he obtained from Java to study in his aerodynamics laboratory





▲ THIS MODEL of a modern jet-type plane shows the swing-back wing shape originated in the "Zanonia" seed

In their native habitat in Indonesia, these seeds are produced in large gourdlike fruit, growing on climbing vines that reach to the tops of tall forest trees. This plant belongs to the cucumber family, and the botanical name is *Macrozamia macrocarpa* (Blume) Cogn. (Sailplane enthusiasts still use the old genus name "Zononia," originally given to the plant.) The vine produces its flowers in January and February, and the huge fruit opens and begins dropping its seeds in August when the prevailing winds blow from the east. To aid in the dispersal of the seeds, nature has equipped them with butterfly-like wings, which are very efficient in carrying them long distances. Dr. David Fairchild, the celebrated plant explorer, observed that these amazing seeds sailed like tiny gliders for a quarter of a mile across a river in the Celebes.

The seedlings of this plant are almost always found growing to the west of trees supporting the parent vines, showing that the winged seeds sail downwind and not, as some have supposed, into the wind. These seedlings are always found under forest trees, and the seeds that land on open ground do not seem to germinate. When the seeds are released, they sail long dis-

tances and usually strike a tree and drop to the ground, where they germinate in the shade and send the resulting vine climbing up the trunk.

It is interesting to note that the wing loading of the "Zanonia" seed is approximately 1/100th pound per square foot of area, and a butterfly's is about the same. By comparison, the wing loading of a buzzard is on the order of one pound for each square foot of wing area.

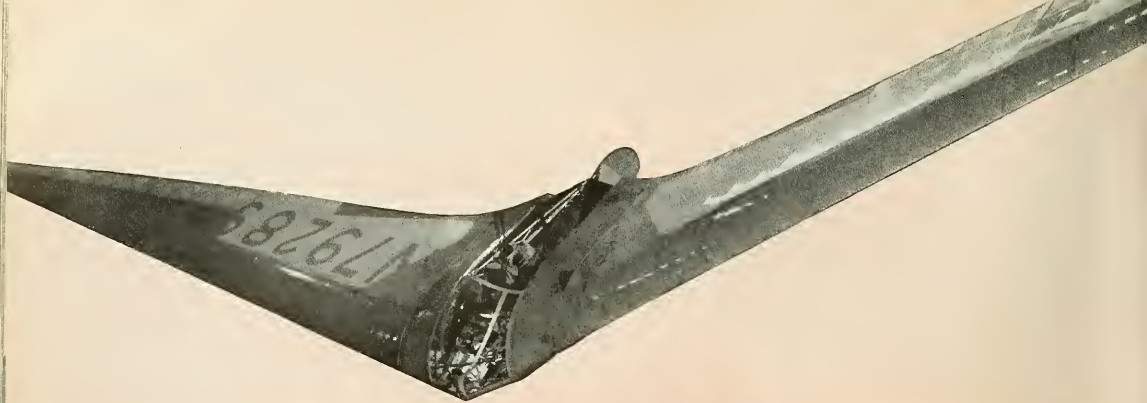
There is an old saying that history repeats itself. Be this as it may, it is a fact that in man's early attempts to master the air he tried to copy the birds, and the first air-planes had flapping wings. Needless to say, they did not fly. As mentioned above, some of the early aerodynamicists were clever enough to consider other methods of flight, as for example that exhibited by this seed. Actually the seed does not fly; it only glides. But, of course, it is only a step from gliding to flying, and man would never have been satisfied merely to glide. He had to master the air as he had mastered other means of transportation. One way or another, man eventually devel-

oped a flying machine that was a hybrid between a bird and a glider, and he then abandoned his studies of the aerodynamics of bird flight and his early interest in the seeds of this interesting plant.

Recently, however, there has been a revival of interest in studies of bird flight and in the sailing characteristics of "Zanonia" seeds. This has resulted, no doubt, from the increasing interest in sailplanes both in this country and in Europe.

Foremost among the present-day workers in this field is Dr. August Raset of the Engineering Research Station at Mississippi State College. Dr. Raset is a well-known authority on motorless flight and has spent a number of years studying the soaring flight of buzzards from sailplanes. In order to shed further light on the problems of gliding flight, he recently turned to these seeds and attempted to analyze their behavior in the air scientifically.

Dr. Raset found that the seeds did not glide as far as they would if their center of gravity was moved back. They glided at a steeper angle than was necessary and fell more rapidly than they needed to. They actually sailed at 6.7 feet per



▲ THE SAILPLANE known as the "Horten IV Flying Wing" is similar in many respects to its prototype, the "Zanonia" seed

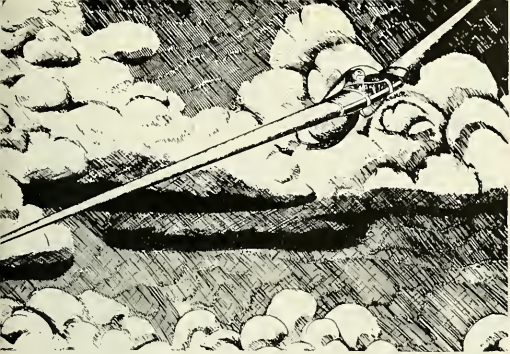
➤ HERE a six-inch "Zanonia" seed is poised on the fingertips. Note that the actual seed is rather far forward on the wing. If it were farther back, the seed could glide farther

▼ THE SEED has left the fingertips and started on its gliding flight. Under normal conditions in still air, it will travel four and one-half feet for each foot of altitude lost



second instead of at a theoretical 3.2 feet per second, which would give them the maximum distance. For example, when a seed drops from a pod at the top of a 100-foot tree, its average sailing distance is about 450 feet. If, however, the center of gravity were moved slightly back, so that it sailed only 3.2 feet per second, then it would be capable of gliding for more than 1,000 feet from the same height. These distances, of course, are calculated for still air.

Most modern aircraft have vertical surfaces or fins to stabilize them in flight, but it is interesting that neither birds nor the seeds of this



▲ LIKE THE "Zanonia" seed, the "Horten IV Flying Wing" has no vertical control fins

▼ IN THIS "Kirby Kit" sailplane, Dr. August Raspet has pursued numerous buzzards on cross-country glides, accumulating information on their flight performance by means of various instruments



▲ THIS SAILPLANE, photographed at the First Southeastern States Soaring Contest at Sanford, Florida, is named the "Zanonia" in honor of the winged seed that has contributed so much to our knowledge of gliding flight



plant are furnished with such controls. How, then, are they able to fly or glide?

The wings of these seeds are very thin, almost as thin as tissue paper. In the air the weight of the seed at the center causes the tips to bend upward giving a "washout," or decreasing the angle of incidence at the tips of the swept-back wings. Thus, the flexibility of the wing gives it stability. The same thing happens in birds whose wingtips, under load, tend to bend upward.

Several early gliders were designed to take advantage of this method of achieving stability. The first to attempt to fly in a large

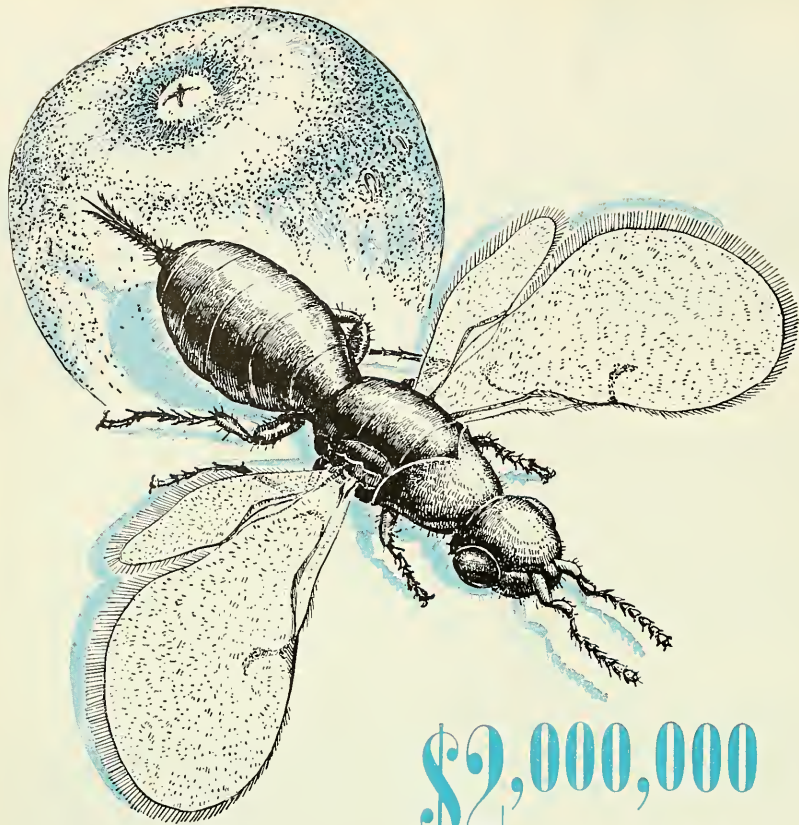
"Zanonia-type" glider were two Austrians named Etrich and Wels. Their glider had no vertical control surfaces, stabilization being achieved by means of deflecting the rear wingtips up or down. Later, a powered version of the "Zanonia-like" glider was built, but it did not have enough maneuverability, which is especially important in planes to be put to military use.

It is an interesting side light that an inflexible structure constructed exactly like a bird or the "Zanonia" seed is not inherently stable in flight.

And so the jungle seeds and the birds were more or less forgotten

in the world's mad struggle to develop faster and better planes, and the all-wing-type craft became but an interesting curiosity. But there came a time in the race to achieve greater and greater speeds when increased drag due to compressibility became a problem. It was soon discovered that the swept-back wing was the solution, and so we come to the "Zanonia-type" configuration again.

Dr. Raspet and his associates believe that there are still many secrets of flight that may be learned from studies of such natural gliders as "Zanonia" seeds and soaring buzzards.



\$2,000,000

Wasp

Search and study on two continents revealed the secrets of a little insect and made possible the development of the great Calimyrna fig industry

By EVELYN ROEDING CUTTLE

THERE is something more than a fig leaf behind that luscious Calimyrna fig you relish. There's an exciting story about a tiny wasp that held the secret to a two-million-dollar industry.

The participants in this real life drama of two continents were some of the smartest men in California's horticultural industry, the U. S. Department of Agriculture, and the little wasp known as *Blastophaga psenes*, whom we shall call Blasto for short.

During more than 20 years, far-seeing nurserymen in California coddled, nursed, and watched over this little creature as they would the most priceless treasure. They knew that if they could only make Blasto feel at home in California, they would hold the key to a great new industry. Today—over 50 years after his "naturalization"—Blasto is cherished by hundreds of growers

and packers throughout the wide fig-producing areas of California.

Blasto isn't much bigger than the head of a match. Even viewed under the microscope, Mr. Blasto is anything but a thing of beauty. He is wingless and partially blind. Mrs. Blasto carries away the honors for beauty. Her fairy-like body resembles a queenly robe of brilliant spangles, and her wings glisten like iridescent jewels. Together they

make a perfect team, each indispensable to the other and both indispensable to the production of the Calimyrna fig.

The Calimyrna is the only fig whose flowers must be fertilized by this insect for the fruit to reach full-grown perfection. Unless this important function, called caprification, takes place the Calimyrna fig withers, loosens its hold on the twig, and finally falls to the ground



California Fig Institute photo

▲ UNTIL the little wasp called *Blasto* was given a satisfactory home in California, orchards of the premium quality *Calimyrna* fig could not appear

when no larger than a marble. This is where the little *Blastos* help.

Calimyrna fig trees produce only female flowers. Therefore, in every *Calimyrna* fig orchard a certain number of *Capri* fig trees are planted to provide pollen for them. The *Capri* figs are entirely inedible in themselves, but in each one lives a colony of the tiny *Blasto* wasps, which perform the act of pollination and thus cause the figs to reach full growth and flavor.

Within the *Capri* figs the *Blastos* carry on their love life, oblivious to all except their prime duty of perpetuating their kind. It is known that when Mrs. *Blasto* escapes from the tiny seedlike gall of the *Capri* flowers, she will make a fervent effort to enter another unpopulated fig. On her wings and body she carries the pollen from inside the *Capri* fig. So, just before she is ready to emerge, the nurserymen

pick the *Capri* figs and place them in wire baskets or perforated bags among the branches of the *Calimyrna* trees. When she emerges, she happens upon a *Calimyrna* fig. Once inside the fig, she finds no suitable place for her young to live. As she forces her way out through the eye of the fig, she scatters the precious pollen from her wings and body onto the gall flowers inside the small green *Calimyrna*.

Shortly afterwards, a startling and remarkable change takes place in the caprifigged fig. It turns a dark green, becomes firm and hard, and shows every sign of a healthy, vigorous fruit. The unfertilized figs, on the other hand, look measly and unhealthy. So even a month before the figs mature, the fig grower can make a fair estimate of his coming crop.

Caprifigation was known even in Biblical times. Eve may not have

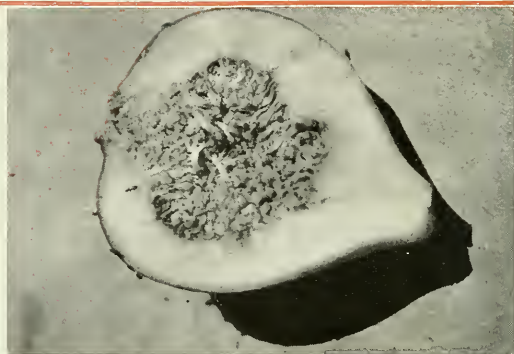
referred to the fig when she said, "We may eat of the fruit of the trees of the garden." But in the next passage she and Adam are said to have "sewed fig leaves together, and made themselves aprons." Aristotle speaks of caprifigation in his writings. Theophrastus mentions that all figs do not require caprifigation.

In our own Western World, the Spanish padres planted figs around their missions in California as early as 1710. These were the Black Mission variety. Later, the White Adriatic fig was brought over from other lands. But the gold miners of '49 found the imported *Smyrna* fig a much greater delicacy than those already growing in California. They discovered that the selling of these imported dried fruits was almost as great a bonanza as the golden treasure itself.

During the ensuing years, some



▲ CLOSE-UP of the male Capri fig, whose pollen the little wasp must carry to the cultivated Calimyrna fig if edible fruit is to result



▲ INSIDE the wild fig are found a number of the wasps that have just hatched. They will now seek out another fig and carry to it the wild-fig pollen that is essential if the fruit is not to wither and fall



▲ CAPRI FIGS, raised for the benefit of the little wasp, *Blasto*. The wasp, in turn, will benefit an orchard of cultivated fig trees by performing the essential process of caprification

of these miners' sons came to be the pioneer horticulturists of California. Like their fathers, they began to agree that the imported Smyrna fig had a sweetness and flavor the domestic figs lacked. Why shouldn't California, with its rich soil and similar climate, produce a fig as tasty and edible as the Smyrna?

This was a challenge to men of vision and foresight, but the obstacles that beset them were scarcely anticipated. One man, George C. Roeding, who is considered the Father of Smyrna Fig

Culture in California, never swerved in his determination to bring the Smyrna fig industry to his state. But one thing he presently knew for certain. The Smyrna fig had to be caprifried, and that meant bringing little *Blasto* over from Smyrna and making him like his new home in the West.

Other horticulturists ridiculed the whole idea of caprification. They called Roeding a crackpot, a faddist. But he only chuckled in his good-natured way and clung more firmly to his beliefs. Even his own father, Frederick Roeding,

owner of the Fancher Creek Nurseries in Fresno, joked about the young man's wild dream of bringing a great new fig industry to California.

In spite of derision on all sides, the dream was taking shape and there were several farsighted men who started to lay the groundwork for its realization. In 1882, G. P. Rixford, the business manager of the *San Francisco Bulletin*, imported fig cuttings direct from Smyrna with the financial aid of Senator Leland Stanford. Our United States consul at Smyrna helped in getting them through, and it was with high hopes that these supposedly best varieties of Smyrna fig cuttings were distributed among the subscribers of the *Bulletin*. Imagine the disappointment of all these people when, after waiting hopefully for the trees to bear, they saw the fruit reach the size of pebbles and then shrivel and drop. The *Bulletin* was rudely censured for giving out a worthless product, but they consoled themselves with the thought that they had been tricked by the wily Smyrnaïtes.

In 1885, E. W. Maslin, a horticulturist of California, went a step further. He planted Smyrna seeds taken from the best imported figs he could buy. The trees attained a remarkable growth, but their fruit failed to mature. Something was

definitely wrong, but what was it?

A year later, the elder Roeding, having become convinced that his white Adriatic figs couldn't compare with the imported Smyrna variety, sent W. C. West, an employee from his nursery in Fresno, directly to Smyrna to study the whole process of fig culture. It was almost too daring to mention it in that year of 1886, but secretly he was sure that the Smyrna fig, in order to mature, needed the wild Capri fig, with its all-important fructifying insect, little *Blasto*.

The mission to Smyrna could hardly be called a rousing success. West's every movement was watched with jealous eyes. No fig cuttings or trees could be exported. It became increasingly apparent that the Turkish Government was not anxious to divulge the secrets of a flourishing industry.

But West was not to be daunted. Finally, with the assistance of an Englishman and a Greek living in Smyrna, he succeeded in exporting 20,000-odd cuttings of the true commercial fig, along with several thousand cuttings of the Capri fig. The cuttings reached Fresno some months later in surprisingly good condition and were planted on the Roeding Fig Orchards in 1888.

About this time, Frederick Roeding turned over his fig orchards and nursery interests to his son, George, then only a young man of twenty. From that time on, the orchards became the center of the most varied line of fig experimentation on the Pacific coast. For fourteen watchful years, heartbreaking disappointments repeatedly shattered his hopes. George Roeding hovered over his fig orchards like an expectant mother and spared neither himself nor money to make his brain child grow. But each time when he seemed about to succeed, *Blasto* weakened and died.

Advice was given freely during all this time by men who were supposed to be experts, though they scoffed at caprification. When Roeding didn't heed their suggestions, they urged impatiently, "Dig up the orchards! Plant other figs!"



▲ GEORGE C. ROEDING, Father of Smyrna Fig Culture in California

This would have been the easy way out, but Roeding only intensified his efforts to bring in little *Blasto* alive and learn more about caprification. Information was meager in those days, but he delved into reports written by leading scientists. One of these men was Dr. Gustav Eisen, who later wrote, "When I first announced my final conclusions about caprification [at a horticultural meeting in Fresno] and of the necessity of importing the *Blastophaga* . . . I was hooted down, and some of the mob whistled."

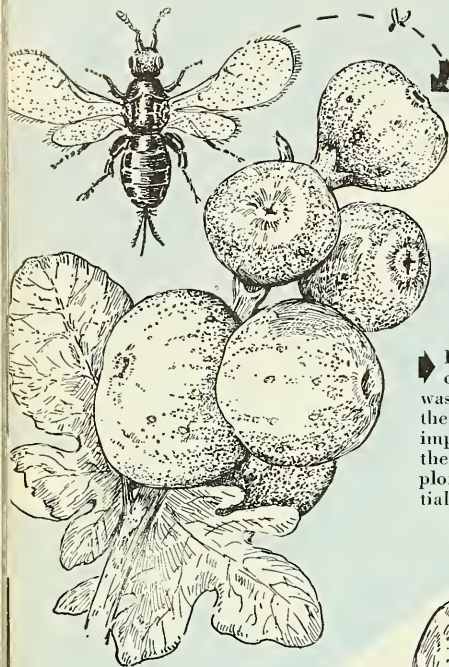
With Eisen's encouragement, Roeding took a daring step forward in 1890. A few of his Smyrna figs and Capri figs had produced fruit, and he decided to try artificial fertilization.

The methods were crude. Opening the male Capri figs and finding their blossoms matured and covered with pollen, he shook some of the pollen into his hand and then by means of a toothpick transferred it into the orifice of the

Smyrna fig to fertilize its female flowers. It worked! All of the half dozen figs that were treated matured; and when dried they had a flavor very much like the imported Smyrna variety.

Fig history was in the making! In 1891, Roeding improved on the toothpick method by blowing the pollen through a glass tube drawn to a fine point at one end. This caused 150 figs to behave properly, "showing Roeding to be some blower and forecasting his expansive abilities in other things than figs," as Edward J. Wickson put it in his history of the nursery plant industry.

When these figs were sent to several leading fruit growers in California, they proclaimed unanimously that they were the finest ever produced in the state and equal to the imported Smyrna fig. But even with these exciting new developments in fig culture, Roeding couldn't convince other growers that caprification was essential for the ultimate success of the fig in-



THE CULTIVATED fig is exclusively of one sex, female. Having no pollen of its own, the fruit will not develop without pollination from a wild fig, the so-called Capri fig. Here is where the tiny wasp, shown greatly enlarged at left, serves the fruit grower. The wasp pollinates the cultivated fig, causing it to grow large and luscious



WHILE the fig depends upon the wasp, the wasp also depends upon the fig. It is within the wild fig that the wasp lays its eggs

IN THIS ENLARGED section of the wild fig, we see the wasp about to lay its eggs in the ovary of the flower. It is impossible for it to do this in the cultivated fig, but in exploring, it deposits the essential pollen



TO PROVIDE for a new generation of wasps, the male, shown here, must be present to fertilize the newly matured female. It gnaws a hole in the ovary of the wild fig



NOW FERTILIZED, the female escapes through the same opening...



... AND in leaving, she becomes dusted with the pollen of the wild fig. In this act, the female wasp becomes the key to the Calimyrna fig industry. The Calimyrna fig has no pollen of its own and will not bear edible fruit unless pollinated from the wild fruit in this way



THE FEMALE WASP blunders into Smyrna figs while searching for wild ones. In this act, she pollinates the fruit, enabling it to develop into the valued product of commerce. She cannot lay her eggs in cultivated figs because of an elongation of their ovaries. Growers in the Near East were observed to hang strings of wild figs in their Smyrna fig orchards. Study of this curious custom revealed the chain of events described here, leading to the growth of the vast California fig industry



dustry. Artificial pollination was only the beginning, he said, and could never be practiced on a wide scale. Furthermore, it was found to be bad for the tissues of the fig.

The future of the Smyrna fig industry in our hemisphere hung in the balance. Roeding knew his trees were good. But the baffling question was how to bring *Blasto* over from Smyrna alive and induce the insect to adopt Fresno as its home.

In spite of the discouragement on all sides, Roeding rallied his efforts once more and succeeded in 1892 and later in 1895 in getting from Smyrna several consignments of Capri figs containing live *Blastos*. He cut open the figs, placed them in jars, and hung them among the branches where young figs were growing. He carefully covered the trees with cloth to prevent the wasps from escaping. But still *Blasto* was stubborn and refused to establish itself.

Finally, in 1897, with his usual dogged determination to exhaust all possibilities, he made a fervent appeal to our Secretary of Agriculture in Washington, the Honorable James Wilson. The Government became fully alive to the importance of introducing *Blasto* and commissioned Dr. L. O. Howard, Chief of the Division of Entomology, to take charge of the work. Dr. Howard, in turn, communicated with a man who had shown a vital interest in caprifigation. He was Walter T. Swingle, a well-known botanist, who was studying at the International Zoological Station in Naples.

Swingle began the chase from Naples in the spring of 1898, sending over a consignment of figs containing live *Blastos*. Again Roeding treated them like royal guests of honor. Still nothing happened. But Swingle kept the figs coming. Now each one was carefully wrapped in tin foil. Roeding continued his artificial pollination and built cloth houses over his trees to protect *Blasto* from frost and other hazards. But he had come to doubt this method and wrote to Dr.

Howard, "I do not think a success will be made . . . until fig trees with fruit on them are sent out during the winter months. If this is done, the insects will have a chance to develop in a natural way . . . just as they do in their nativity, passing from one crop of Capri figs to the following one."

Then suddenly, on a warm day in June, 1899, a momentous event took place. An employee of Roeding was busy with artificial pollination in the orchard when he came upon a fig that definitely showed the presence of little *Blasto* itself. In the exciting days that followed, more figs proved that *Blasto* had been working on its own and had left the figs green and plump. Roeding knew at last that he was on the threshold of a great new industry and communicated with Dr. Howard in Washington. To forestall any reverses, Dr. Howard sent E. A. Schwarz, an expert entomologist, to study *Blasto* at work on Roeding's orchards and to make detailed, hourly observations of the amorous functions of the tiny wasp.

They were over the hurdle! Roeding sponsored a contest to give a name to the new fig. "Calimyrna," a contraction of "California" and "Smyrna" was submitted by one contestant and was chosen and copyrighted. Fig growing promised to rival raisin and prune growing in importance and give the orange a heated race. To assure its ultimate success, Roeding decided on a bold step. He would go to the very heart of the fig industry, Smyrna itself, and clear up the doubtful points that remained.

Fortified with an appointment as Commissioner of the U.S. Department of Agriculture and armed with letters of introduction to representatives abroad, Roeding departed from Fresno with his family in May, 1901. Leaving them safely ensconced in Berlin, he set forth on his colorful journey to Constantinople. Travel in Europe in those days was anything but a jolly treasure hunt. The trains moved like half-drugged snails and were small

and dirty. This was long before the "modernization" of Turkey; and before reaching the frontier, Roeding was warned to conceal all books and weapons, but he failed to hide an electric lamp. The custom-house inspector snatched this and promptly confiscated it as a child would take a fascinating new toy.

At Constantinople, he found he'd only begun the battle. The Turkish officials quickly took his passport away, saying it had not been properly visaed in Berlin. He then learned he would be forbidden to travel in Turkey without the *Teskera*, a Turkish passport, impossible to obtain without his own passport. Roeding appealed urgently to our consular office in Constantinople, emphasizing the importance of his immediate departure for Smyrna. But the U. S. officials warned him that the Turks were indifferent about rushing into any kind of business for a tourist. As predicted, they took their own sweet time about it; but finally, with a liberal use of *baksheesh*, the proper palms were greased and Roeding had his passport.

Plundering the American seemed a popular pastime of the day. Roeding found he had to put up an additional sum of money at the steamship office to secure his passage to Smyrna. After a circuitous route around the Sea of Marmora, the small iron tub finally pulled into Smyrna. There his books were pounced upon, and it was not until the government wheels were generously oiled again that he retrieved them.

His accommodations at the hotel where he stopped proved to be far from elegant. But the bedbugs were of a mild variety, he commented, in comparison with those in other caravansaries in the interior of Asia Minor. Fortunately, the interpreter, or dragoman, provided by the American Consulate secured lodging for him with a Greek family in Aydin, the commercial center of the fig orchards. Roeding never forgot their kind hospitality and repaid them with generous gifts of



◀ A CROP OF CAPRI FIGS, not sold as edible fruit but carefully cultivated to provide the pollen

▼ PAPER BAG used for distributing Capri figs in an orchard of Calimyrna trees. The wild Capri fig trees, with their cargo of wasps, were only brought to this country successfully after several attempts. Now, wherever Smyrna fig trees grow in California, wild fig trees with their wasp-laden fruit are grown near by. The health of the little insects is of major importance to the fig orchards, and they are reared by the millions in sterile incubators



Research Dept., California Fig Institute, Fresno, Calif. Photo

money some years later when the Turks ravaged their land.

Roeding felt it was wise to feign complete ignorance while he studied and visited the orchards in and around Aydin. Only the American consul in Smyrna knew he was seeking to learn more about little Blasto. But suddenly one day he found himself in a blaze of publicity—the last thing he wanted!

A Greek newspaper printed an article from the *Saturday Evening Post* containing extracts from Dr. L. O. Howard's report on the Smyrna Fig in California from the U. S. Department of Agriculture Year Book of 1900. Evidently, a copy of the *Post* had been sent to a correspondent in Smyrna. George Roeding and his long work with the Smyrna fig were given conspicuous prominence throughout the article. Roeding's host took it well, but the rest of the Smyrnaites weren't so forgiving. The newspapers warned the public in no uncertain headlines that George Roeding was there to steal the secrets of their most flourishing industry. Under no condition were they to give out any information to him.

All might have been lost and the 8000-mile trip to Smyrna in vain

if Roeding and his interpreter hadn't devised a quick way out of the dilemma. From then on he would assume the alias of "James George." The plan worked, and the way was safely paved for a return trip to Smyrna later in the summer.

Amazing as it was to Roeding, the fig growers of Asia Minor—in fact, all the people with whom he came in contact—were as ignorant of caprifigation as were their forebears. Oh, yes, they knew the little wasp was absolutely essential to the production of the Smyrna fig, but as to how Blasto lived and loved and propagated its kind, they knew nothing. Before leaving Aydin, Roeding had the pleasure of telling his host the facts of life about Blasto. His host exclaimed, "I have been the owner of fig orchards all my life and my father before me, but your explanation of how the little insect performs its functions is the first clear understanding I have ever had of the subject."

All this was very flattering, but Roeding insisted there were certain doubtful points about caprifigation he had to clear up. He wanted to know how often it was necessary to distribute the Capri figs and the number required for each Smyrna fig tree.

To Roeding, it was a novel and interesting sight to watch the veiled Turkish peasant women trudging slowly through the narrow streets of Aydin in the early morning hours toward the fig bazaar to sell the male Capri figs. On their heads were perched baskets laden with the figs. They would squat down at the bazaar and patiently wait for the buyers. About 7 A. M. the growers would come along, feeling quite free to break open a fig to see if it was well supplied with pollen and to make sure that little Blasto was present. If so, they made a quick purchase and loaded the figs in

bags, hoisted them on donkeys, and departed for their respective orchards.

Having observed the workings of Blasto on the first crop of Smyrna figs, Roeding left for Berlin, hoping to return later to watch little Blasto carry out its functions on the second crop of figs.

In the latter part of August he made preparations for his next trip to Smyrna. This time he played safe and had his passport properly visaed at the Turkish Consulate in Berlin.

When he was about to set off, he learned to his dismay that bubonic plague was raging in Constantinople and that the port was closed to all outgoing ships. He wired Agadjanian, his interpreter in Smyrna. Agadjanian telegraphed back that he knew a way out and urged him to come. The faithful interpreter was there to meet him when he reached Constantinople and arranged the trip by train to Smyrna.

The harvesting of the fig was in full swing when he arrived. Delighted that he had made it just in time, Roeding again assumed the name of James George to avoid reporters and took up lodging in a private home. The opening of the fig season was heralded by a gay festival with more than 30,000 inhabitants participating. Roeding noted every minute phase of fig culture, from caprification to the final packing and shipping. He watched incognito the gathering of the crop, the drying of the figs on rushes, the storing in adobe structures, and the final transportation in goat-hair sacks on the backs of camels to the railroad stations.

With the supreme satisfaction that he had investigated every step in the growth of the Smyrna fig, Roeding took his departure from Smyrna in September, carrying with him an assortment of fig cuttings, which he forwarded to the Department of Agriculture in Washington on reaching Naples.

The advent of commercial fig culture in California was enthusiastically proclaimed by the news-

papers throughout our country. Letters and inquiries flooded Roeding in such overwhelming volume that he was induced to write *The Smyrna Fig at Home and Abroad*, a small book covering every detail of the Calimyrna fig from the love life of Blasto to the practical value of planting and owning a fig orchard.

As often happens in a world of progress and achievement, a heated controversy arose as to where the credit should go for establishing Blasto and bringing a new food to our land. Edward J. Wickson, in his history of the nursery plant industry, very nicely states the case when he says, "Among the many contributions to the science and practice of California pomology which have been made by our nurserymen, none can compare in insight, devotion, persistence, and expenditure with George C. Roeding's pursuit of the Smyrna fig and the bug thereof . . . the most unique and long-sustained effort ever put forth by a nurseryman . . ."

But George Roeding was the first to pay tribute to others who materially and faithfully assisted in the great enterprise that had covered a score of years. Among the outstanding horticulturists already mentioned were James Shinn and John Rock, both early experimenters with the fig. And last, but certainly not least, a profound vote of appreciation is due those eminent entomologists, Doctors Howard, Swingle, and Schwarz, whose untiring efforts to introduce and domesticate little Blasto gave the crowning touch to the momentous achievement.

With all that had been accomplished, Roeding still felt there was work to do. He couldn't sit back and expect the American people to take the Calimyrna fig to their hearts—or rather to their stomachs—overnight. For years they had been buying and eating the imported Smyrna fig. Now they must be educated—especially our eastern consumers—to appreciate the quality and cleanliness of their own domestic fruit. But how? Roeding

devised a plan, and it proved successful. Over a period of years, he sent samples of both fresh and dried figs to many leading tradesmen, fruit growers, and shippers throughout the country. In time, the problems of processing and marketing were solved. His missionary work in these endeavors laid the groundwork for the acceptance of California's newest fruit product.

Now that little Blasto was here to stay, it was natural and fitting that Roeding should be among the first to start his own fig business on his place just a few miles east of Fresno. In 1903, he incorporated the Roeding Fig Company, distributing shares among a few relatives and friends. It was a humble beginning with only a small packing shed and about 25 workers. But in that first year of 1903, the company handled 257 tons of figs, which grossed \$15,420. Since then this little company has expanded into what is now our country's largest concern devoted solely to fig production, with packing and storage plants covering several blocks in the city of Fresno. It now does an annual business of over a million dollars in Calimyrna figs alone.

Six other large fig-packing companies have sprung up during recent years in the rich San Joaquin Valley. At the height of the busy season, they employ about 3500 people, and each packs 1000 tons of figs or more. Over 12,000 acres of land are planted with the Calimyrna fig throughout 7 counties of California, with the crop for 1952 having an estimated farm value reaching beyond the four-million dollar mark.

So, when you glance at a colorful recipe book showing luscious fig cakes, puddings, and other sweets, you may be sure of one thing—the Calimyrna is here to stay. And for that, we may be duly thankful to little Blasto and to that great team of pioneer horticulturists, fig growers, and packers who pulled together in line with nature's own methods to provide a good and bountiful food for all to enjoy.



▲ "TANGA TIKA" attempts to portray Polynesian life as it is lived today in Tahiti. The outrigger canoe is a remnant of the old native way of life



▲ LARGE OUTRIGGER canoes with sails are used to carry copra from one islet to another in the South Pacific



▲ ORANGES grow high in the Tahitian mountains and getting them to market is no easy task

Tanga Tika

PUBLICITY releases on "Tanga Tika," which is filmed in the Tahitian Islands, say that Dwight Long, producer, director, and photographer wanted "to produce the real story of the people of Tahiti at home, at work, and at play, their customs and their dances." Your editor in viewing the film was aware only that she was seeing a simple love story in a beautiful setting. The plot development depends on such obvious complications that there is little suspense.

The story is that of Timi, son of a Tahitian island chief, who left his country home and went to the big city of Papeete, the capital of French Oceania, and fell in love with a girl who returned his love on first sight. The girl's mother leads an easy life getting credit from a Chinese merchant. The merchant's son, like Timi, is attracted to the girl and wants to marry her. The struggle, of course, is around Timi's effort to earn enough money to pay off the merchant and marry Nenu.

It was not until I was driving back to the Museum with Dr. Alphonse Riesen-

feld, an anthropologist at the American Museum of Natural History, that I realized what value the film could have had from both an anthropological and an entertainment standpoint if its meaning had been gotten across.

Dr. Riesenfeld said that to show what life in Tahiti is really like today one would have to show the great struggle that is going on all over the world where native ways of life cross the paths of civilization. This crossing has been going on long enough in Polynesia for us to see some of the results. Some of the old ways of life still exist, some of the new have been adopted. This change cannot be stopped, but in its wake there are many problems arise dealing with all aspects of life.

"In this film," writes Dr. Riesenfeld, "many of the problems are hit upon, but it takes an anthropologist to understand what the film is trying to do, and the meaning will be lost on the general public.

"Nenu and her mother's contact with the Chinese merchant is a subject full of fascination and dramatic potentialities

because of the clash between native naïveté and Chinese sophistication, but the subject is passed over so lightly one hardly gets the point.

"When Timi finally gets most of the money he needs to pay the Chinese merchant by winning all the sports events on a national holiday, the natives suggest that he spend the money on a feast that all can share in. The bewildered spectator will hardly understand the conflict between the native conception of collective property and the intruding western idea of private ownership.

"There are innumerable small evidences that show the changes that have come as a result of contact between the two cultures, such as the hulas with solo parts, the use of the guitar and the accordion, elements of the comic, and the exaggerated erotic character of one of the dancers.

"There are a few elements in the film that show the old native way of life. I enjoyed the beautiful outrigger and double canoes, the throwing of the javeline, the climbing of coconut palms, the planting of coconut and the fishing scenes,

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES



▲ IN "MOGAMBO" we see Africa made over for Gable. MGM production



▲ LIONS HOVER around the animal trap into which ingénue Grace Kelly has fallen. Gable, of course, is soon on hand for a dramatic rescue

where the method of stoning the water in order to drive the fish into a net is used. Apart from these brief flashes, I get only fleeting glimpses of native culture; a native house is briefly shown and an earth oven on which a pig is stewed. Here again no emphasis is given to these elements, and they pass so quickly that the average observer will hardly notice them.

"Even an anthropologist is willing to be carried away by the pleasantness of the scenery and the story, but the marquee lights have me puzzled. "How can this film be called "Tanga Tika" when the local Tahitian dialects drop the "ng" and the "k."

Mogambo

"MOGAMBO," writes Dr. Harold E. Anthony, Chairman of the American Museum's Department of Mammals, "poses a problem for the person who sees it and has any knowledge of Africa and its fauna and flora to influence his reaction. A great deal of the footage, undoubtedly the greater part, is pure Holly-

wood in scenario, staging, and the various devices to secure illusion. Part of it is truly African as the camera found it on location. In between these two patterns is the footage that is a composite of actual happenings in a synthetic environment. There is nothing to show that the action is all in sequence, in the same environment, or even took place at all, except as the film cutter brought widely separated shots together. This synthesis is done skillfully and has terrific dramatic effect, but the beholder should not be tricked into believing this is truly Africa.

"The plot is simple and little is left to the imagination. Clark Gable acts the part of a rugged, efficient collector of wild animals for zoos and circuses. He has a well-organized establishment and is persuaded to be the guide and white hunter for an anthropologist, accompanied by his wife, who wishes to study gorillas. Ava Gardner, as Eloise Kelly, a widow in search of forgetfulness, goes about things in happy-go-lucky fashion. The inevitable triangle of white hunter, anthropologist,

and wife becomes the dominant factor. The widow is at hand when the triangle falls apart. There is little about the human activity in this film to single it out of a host of past, present, and future productions based on the same topic. The question of most interest for the readers of NATURAL HISTORY relates to the portrayal of the African scene.

"After making due allowance for the intrusive elements brought into association with African settings, there is one unique feature beyond explanation by this reviewer. The sequences of the gorillas are beyond question the best he has seen. It seems certain, however, that these animals are restricted or conditioned in some manner not apparent in the film because such action, in good light close to the camera, just does not happen in a state of nature. Some of the gorilla behavior is surprising and unexpected, as when an animal up a tree beats its chest. The gorilla action will have the close attention of the audience and is deservedly the climax of the film, triangle or no triangle."

Your editor thinks that it's too bad that a picture that has some of the nice animal scenes in it that "Mogambo" has cannot be recommended to children, and it's baffling that so suggestive a plot as this one is given unrestricted distribution when a completely natural native film like "Latuko"¹ was suppressed.

And Don Carter, another American Museum mammalogist who knows Africa from hard expedition work, is more perturbed about the leopard that got away than actor Gable was. "He had lost one of the rarest animals in Africa," writes Mr. Carter. "A few black leopards occur in the mountains of Ethiopia, but in other parts of the continent, including the locales of this picture, they are so rare as to be practically unknown. Most black leopards come from southeastern Asia."

¹NATURAL HISTORY, Sept. 1952

Brief comments on films previously reviewed

Documentary and Grade A

Below the Sahara

African wildlife film made on location

Interesting sequences of African fauna and native peoples. Authentic flavor

The Living Desert

Disney's first feature-length True-Life Adventure film, showing animal and plant life in the Great American Desert

Marvels disclosed in this film must be seen before one can sense full significance

The Sea Around Us

Marine natural history filmed in color

Some superb shots, but as a whole a highly disappointing production

Down the Alphabet

Return to Paradise

Based on Michener's story "Mr. Morgan" in his book "Return to Paradise"

Good fun. Broadly speaking gives a fairly authentic view of a Polynesian island community



1954

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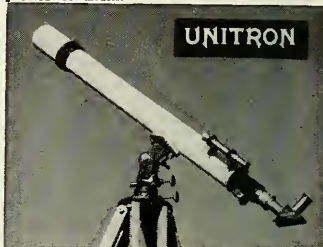
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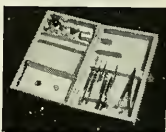


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done a great deal of reading herself, and she has found many obscure observations on insects that have escaped the notice of other writers. The book is very well balanced. It starts out with the structure and growth of insects, their senses and protective devices. It is pointed out that without insects we would be almost wholly without fruits and flowers, and without insect parasites and predators of injurious species, insects would surely inherit the earth. It is also shown that crop pests are due to man's activity, especially where the farmer has cultivated huge areas of one kind of crop, which would normally grow in very limited quantities and would be difficult for insect enemies to locate. This has produced ideal conditions for the foraging insects, and it is only natural that they have become pests.

The pages dealing with locust migrations will enlighten anyone who is not aware of the enormous numbers in which these insects occur and the damage they cause. One might disagree with the statement that only natural causes will control them. Man has made great progress in predicting their outbreaks and in chemical control by use of airplanes to disperse the chemical poisons.

The best sections of the book concern Miss Cheesman's own careful observations of the behavior of insects. I have found references to many things that are new to me and have learned a lot.

C. H. CURRAN

HOW ANIMALS MOVE

by James Gray

Cambridge University Press, \$3.00

114 pp., 15 plates, 52 figs.

THE ability to move voluntarily from one place to another is the obvious character that at once distinguishes the animals from other forms of life. In writing this book on how animals move, James Gray's aim was to explain the principal features of animal locomotion for readers without any previous biological knowledge. First, he points out to us the simple laws that govern all motion and the principle of the force that supplies the necessary energy to drive the animal motor.

By means of photographs and some 70 illustrations and diagrams by Edward Bawden, we see how the rhythmical machinery of animals operates and propels them into action. Professor Gray goes on to explain how these forces are channeled in a variety of ways to meet the particular needs of animals that live either on land, in the water, or in the air, and he compares them with the machines developed by man. Here we see how the body of a snake as it glides along by muscular backbone propulsion follows exactly the same sinuous course that is set by the snake's head. We learn how the wings of

birds and bats counteract the pull of gravity and drive the body through the air. Here, too, we are shown how the fishes and dolphins are propelled through the water by means of vertical tail fins or horizontal flukes. In the four-footed animals that walk or run we learn that the body rolls diagonally forward, and as Professor Gray puts it, "A galloping horse marks, perhaps, the end of one of Nature's great experiments, for here the power by which a horse is driven forward comes almost entirely from the muscles that move the limbs."

The picture given by Professor Gray is, of course, necessarily a brief one. Only a few of the common animals are featured to demonstrate those that crawl, walk, run, jump, swim, and fly.

How Animals Move is simple and easily understood and will encourage you to observe the motion of animals on your own with far greater interest than in the past.

James Gray is a Fellow at Kings College and a professor of zoology at the University of Cambridge. He gave a series of Christmas lectures on this subject to a juvenile audience at the Royal Institution in 1951.

GEORGE C. GOODWIN

A HERD OF MULE DEER

by Jean M. Linsdale and P. Quentin

Univ. of California Press, \$8.50

567 pp., 174 figs.

THIS beautifully prepared, printed, illustrated, and wholly comprehensive monograph is devoted to the broad subject of animal behavior. In it the activities of mule deer in relation to their environment appear to have been treated from every imaginable angle. The range of pertinent related subjects can be scanned quickly by means of the contents.

Besides containing much new data, the book is a vast reservoir into which the authors have packed everything they have been able to discover relating to our knowledge of the mule deer. The index alone occupies nine pages.

G. H. H. TATE



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LETTERS

continued from page 386

conditions, even over considerable distances. The birds, however, had definite individual flying experience in the area of the "home," which was thus considerably more than a point of merely ancestral significance.

There was an experiment with wild mallards hatched from eggs that had been taken from England, where this species is sedentary, to Finland, where the local population is migratory. The young ducks adopted the migrational behavior of their foster parents but made no attempt to return to their country of origin. Experiments with young storks taken from their nests in eastern Germany and later released at various western points produced a variety of results, but many of the released birds similarly followed the migration route customary for the storks of the region where they were released. The European starlings imported into this country many years ago have developed an extensive local migration without any observed attempt to fly to Europe.

An escaped parakeet, therefore, might try to return to its cage after a taste of freedom or might adopt an independent and vagrant existence as long as it could survive, but it is more than doubtful that it would attempt a flight to an ancestral home, especially one with which it had no individual experience.

JOHN T. ZIMMER

Travelers Akin

Sirs:

For several years I have been a subscriber to **NATURAL HISTORY Magazine** and have always thought that it was one

of the most interesting magazines published.

In July, I took my vacation in Mexico, and on the way there stopped at the Havana airport to change planes. The following incident occurred at the airport, and I thought it would be of great interest to you.

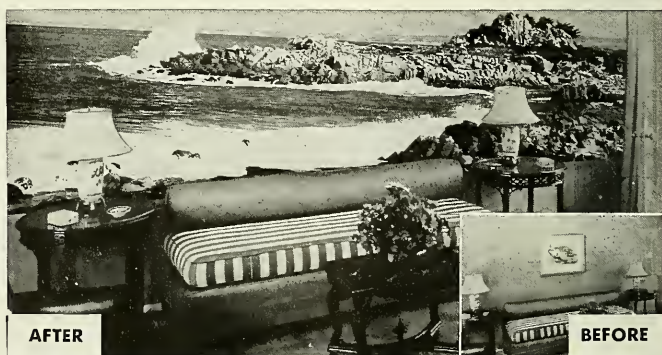
My friend and I were sitting in the air-conditioned lounge trying to keep cool. At the next table sat a man and his wife. Travelers being friendly people, we soon were all talking together. During the course of the conversation, I learned that this man and his wife traveled on business outside of the United States a great deal. He asked about New York and soon we were discussing the American Museum of Natural History, which I visit often. Naturally I mentioned **NATURAL HISTORY Magazine**, and he said that, strange as it might seem, he has been able to see copies of it in many far-away places. He had wanted to subscribe to the magazine but feared it would be almost impossible for your Circulation Department to follow his everchanging address.

After some discussion, it occurred to him that, since his son was attending college in the U.S., the magazine could be sent to him. His son could then forward it. He asked me if I would forward his \$5.00 and his son's address to your Circulation Department.

It should be gratifying for you to know that your subscribers are so pleased with **NATURAL HISTORY** that they recruit new members for you wherever they go. Thank you for maintaining such a consistently interesting magazine.

LOUISE MEHLER

New York, N. Y.



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The basic Kodak Ektalux Flashholder operates with internally synchronized cameras; for cameras with non-synchronized shutters there's an accessory solenoid and synchro-switch outfit, at \$21.60. Matching Extension Units, \$12.40. Depending on bracket, the basic unit runs from \$29.75 to \$33.85.



Kodak Ektalux Flashholder

Where flash requirements are not as complex or frequent, the new Kodak Standard Flashholder at \$8.25 is a thrifty answer. The strong, smooth plastic case is shaped to fit the hand . . . opens up to provide easier cleaning and reveal the simple, rugged internal construction—no wires; heavy strap connectors. Positive spring ejector, kink-proof permanently attached cord; unit detaches easily and quickly from bracket for off-camera lighting. May be adapted to B-C operation with Kodak B-C Flashpack (\$2.95). The Flashpack may also be used with most other flashholders taking two "C" cells.

By the way, a 45-cent investment for the simple, plastic Kodak Two-Way Flashguard will relieve you of all your worries about those once-in-a-million flash lamp blowups. And the choice of clear or diffuse lighting it gives you makes for more lighting control. Comes with Standard Flashholder.



Kodak Standard Flashholder

Kodak The trend in picture taking . . . black-and-white or color . . . is toward use of filters for better light control.

With rare exceptions almost any picture can be improved through the use of the proper filter . . . to set off the clouds, bring out the detail in foliage, improve skin tones, or to better color balance. Your Kodak dealer has a complete assortment and will be glad to help you with your choice (Series V, \$1.95 and \$2.75; Series VI, \$2.25 and \$3.00). A real buy for use with inexpensive cameras is the Kodak Cloud Filter at \$1.85.

Kodak New Kodalux Highlux Projectors give more screen brilliance, provide maximum protection to slides, allow conversion.

Flexibility is the new word in slide projectors. Now you can start with a 300-watt power-cooled unit—or you can start with

a thrifty 200-watter, and convert it later by adding a blower case and 300-watt lamp. It's a new idea—and a help to many budgets.

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In the 300-watt class is the Kodalux Highlux III Projector, incorporating a powerful (but very quiet) blower in the carrying case base (see picture below).

Each Highlux Projector incorporates a brand-new, and improved, double-condenser optical system that gives you unbelievably brilliant screen images. Ask your Kodak dealer to demonstrate the difference. In both, the slides feed in from above, doing away with unintentional repeats and side-to-side jarring.

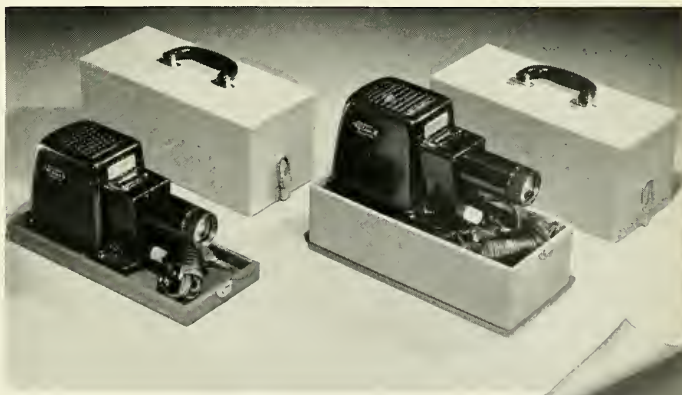
You can buy the Highlux III complete with blower case for \$56.50; the Highlux II for \$36.50. The blower case and 300-watt lamp can be added to the Highlux II at a later date for \$19.20 and \$2.59.

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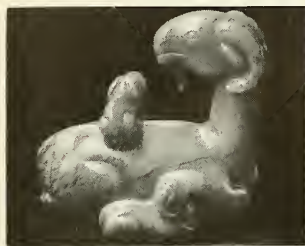
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Authentic Reproductions of Museum Treasures



Chilin The beautiful yellow-green jade tones of the original carving of this mythological animal have been captured in the reproduction. This copy of a precious original, which might have been found in the homes of the wealthy during the Ming Dynasty, will add to any living room of today. Three inches in length. \$13.75 Postpaid.



Ancient Dragon Vase

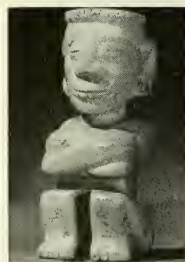
A reproduction of an unusually handsome piece from the Han Dynasty, probably carved as an altar piece for a wealthy home. Brought to you in the pale green and warm brown tones of the nephrite original. The carved design is a highly stylized representation of a dragon, symbol of goodness and strength. The Oriental motif is carried out in the contemporary base. Magnificent as an ornament by itself, or as a flower vase. Height including base: 6½ inches. \$13.50 Express Collect.



Mauve Elephant This cunning little elephant has been reproduced in the unusual mauve coloring of the original jade carving, which is considered to be of the Kien Lung period. For centuries the elephant has been popular in Chinese art, as a symbol of strength and sagacity. 2 inches high to tip of trunk. \$5.25 Postpaid.



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Oaxacan Figurine This arresting little figurine is a reproduction of an original in green stone found near Oaxaca, Mexico. It is in a style attributed to the Mixtec, a people who maintained one of the most important cultures of the late periods in Pre-Conquest Mexico. About three inches high. \$4.00 Postpaid.

Hand-Carved

Primitive



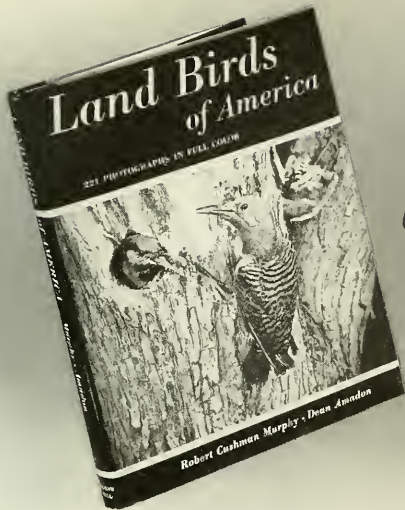
Sculpture

From Africa

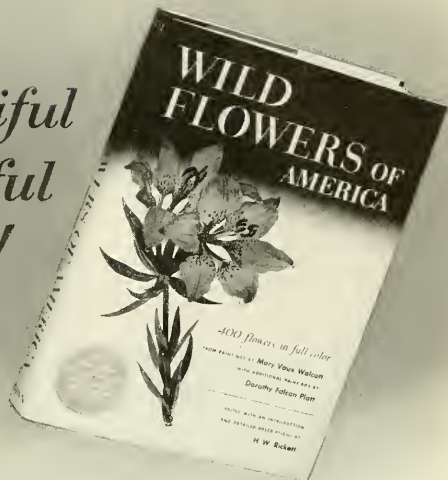
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The Museum Shop
The American Museum of Natural History
New York 24, N. Y.

LETTERS

Mystery of the "Mushrooms"

SIRS:

I enjoyed reading both of your articles about the Chavante Indians and will look forward to your next article.

The black centers on top of the mysterious "mushrooms" look like shadows cast by something circular or globular above the umbrella part of the mushrooms. Some of the umbrellas have broken and even flattened sides. Could these be stands for curing fibres?

Some of the white objects in the foreground look like dogs.

LARS BENNETT

Modesto, Calif.

Although the author of the articles mentioned above did not see any dogs at the Chavante encampment where he met the Indians described, dogs are unquestionably visible in the aerial photographs of the large village, as Mr. Bennett suggests.—Ed.

SIRS:

Your article on the Chavante Indians, and particularly the mysterious "mushrooms," interested me greatly.

I should like to suggest that these peculiar objects may be elevated structures for the dead, somewhat similar in purpose to the elevated platform burials of some of our North American Indians. They look to me as though they may be of basketry, with the dark spot on top presenting the opening.

The overall plan of the village, directed to focus down the "estrada," suggests to me that this road may lead to the permanent burial ground, perhaps used periodically.

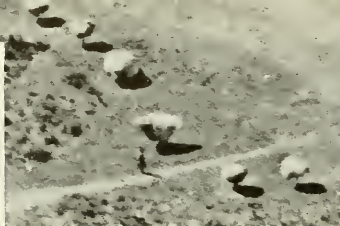
We are looking forward to your next articles.

EMERSON VENABLE

Pittsburgh, Pa.

SIRS:

Maybe those mysterious Chavante "mushrooms" you photographed from the air are totem poles à la Mato Grosso with a significance similar to the ones of our wood-carving Tlingit friends in the Pan Handle of Alaska. The fact that the "mushrooms" appear in groups of one, two, three, or four in front of each thatched house may mean that they correspond to the number of families living in each house. . . . I do not think that food or any kind of valuable gear would be parked so far away from the houses; weapons and food would surely be kept inside the house. My guess is merely arrived at by the weak process of elimination.



Your remarkable journey and collection of data has my unbounded admiration, and I can hardly wait for the next issue of NATURAL HISTORY.

FENLEY HUNTER

Flushing, Long Island

SIRS:

Your first installment of "Assignment Amazon" is tremendous. . . . I felt my flesh creeping several times during the reading.

Have you thought of the best solution of all to the "mushrooms?" They are mushrooms.

WORTHEN PAXTON

New York, N. Y.

The following information comes from Lincoln de Souza in Rio de Janeiro, who is the author of a recent book in Portuguese entitled *Among the Chavantes of the Roncador*. He was associated with some of the most interesting activities connected with the pacification of the Chavantes to the north of Chavantina during recent years. He writes from the Editorial Offices of the publication *A Noite*.

SIRS:

The round objects supported on only one leg in front of the huts of the Chavantes which you showed in your aerial photographs are also in a photograph we have here in the Editorial Office of *A Noite*. But this is a village that has not yet been visited by civilized people, and I was unfortunately unable to shed light on them from my own experience. I was ready to tell you this in a letter when I realized that Senhor Francisco Meireles, the pacifier of the Chavantes, was here in Rio. I immediately sought him for the purpose of finding out what he might know about these objects.

Meireles told me that these huge mushroom-shaped things are supports made of straw, standing on a wooden leg, where the Chavantes deposit wicker baskets and other household utensils, and also put locusts, corn, and the like to dry in the sun.

By good fortune, I then discovered in the archives of our publication a close-up picture of one of these supports, photographed in another Chavante village [some distance to the north of the one shown in the aerial photograph in



NATURAL HISTORY Magazine], which was visited by the aforementioned Indian expert.

I feel sure that this information will satisfy the curiosity that has naturally been aroused by these objects.

L. DE SOUZA

A Noite,
Rio de Janeiro,
Brazil

This undoubtedly solves the mystery of the "mushrooms." The accompanying photograph clearly shows that palm fronds or other dry plant material has been used to construct these curious tree shaped objects. Two or three baskets, possibly containing foodstuffs, are visible. Possibly the purpose is to keep the material off the ground and at the same time protect it from the sun. Though the photograph was probably taken in the dry season as were the aerial views shown in NATURAL HISTORY Magazine, it is also possible that the objects are useful for their rain-shedding ability.

The only riddle that remains is posed by some of the remarks contained in the above letters from our readers. Why would the people go to such trouble to provide a place for things that could easily be stored inside their huts? Presumably the materials hung from these supports or placed on top of them need either sunlight or a free circulation of air.—Ed.

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December, 1953

Volume LXII, No. 10

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From a color photograph by Woody Williams

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THE COVER THIS MONTH

The so-called Feather Duster is not a plant, as some might imagine it to be, but an animal. The bright plumes of the one shown here, whose scientific name is *Eudistylia vancouveri*, are often visible in shallow water in the bays along our West Coast. The creature is a marine worm, which lives in a tube that sometimes grows to a length of two to three feet. The blossomlike form disappears instantly when the sensitive dots that are scattered over the tentacles receive warning of danger, even if only a shadow. The animal has numerous appendages called "parapodia," which enable it to propel itself up and down the tube. This remarkable underwater view was photographed by Mr. Woody Williams, who was the author of a short article on this subject in the September, 1951, *NATURAL HISTORY*.

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- - - by Robert Cushman Murphy
and Dean Amadon

McGraw Hill Book Company, Inc., \$12.50,
240 pp., 221 color plates,
43 black-and-white photos.

BOOKS that are primarily vehicles for natural history illustrations frequently have texts of poor quality. To find a volume, particularly in the field of popular ornithology, which combines superb illustrations with superb writing is a notable occasion. *Land Birds of America* is a singular example of this rare combination.

Contained in this attractively designed book are 221 outstandingly beautiful color photographs taken by many of this country's best wildlife photographers. Two hundred species of American land birds are pictured, ranging from the ubiquitous robin to the rare Kirkland's Warbler; from the Yellow-shafted Flicker of the East to the Gila Woodpecker of the West. Never has such a magnificent collection of bird photographs been presented in a single volume.

The text is divided into 30 short chapters—one for each major group of species. Instead of the usual potboiler of trite and unimaginative wordage, the writing is a lively and authoritative blend of interesting facts and personal experiences. There is not a single stodgy paragraph, although some of the information presented has been hidden heretofore in technical publications. This is the popularization of science at its best.

For the novice naturalist this book is a perfect introduction to a fascinating study, while even the most experienced birder will find its outlook fresh and stimulating.

RAYMOND A. PAYNTER, JR.

MAN, TIME, AND FOSSILS

- - - - - by Ruth Moore

Knopf, \$5.75
411 pp., 32 pl.

EVOLUTION in general and human evolution in particular are here treated by a skillful newspaper writer. The story is centered on personalities. The chapters are tabloid biographies of scientists, with discussion of the bearing of their work on the central theme of the book. Over half the book is devoted to general theories of evolution, although titled "Man's origins." Here the sketches are of Darwin, Lamarck, Giard, Cope, De Vries, Mendel, Haldane, Fisher, and Wright. A brief second section, "Man's buried record," is devoted to a few of the many fossils bear-

ing on human origins and to their discoverers: Dubois, von Koenigswald, Black, Weidenreich, Dart, and Broom. The concluding section, "A changed theory of man's evolution," is mainly concerned with recent redating of some finds and implications of the new dates. Here the students profiled are Knopf, Oakley, Libby, and Washburn.

The book is the most up-to-date of the many in its field. It is literate, interesting, and usually accurate. Numerous photographs, a reading list, and an index enhance its value. (The text illustrations, however, are more decorative than informative.) On the whole, the work can be highly recommended to the general reader.

From a more professional viewpoint, the biographical method has raised insoluble or, at least, unsolved problems of continuity and selection. Some of the inclusions, many of the omissions, and part of the emphasis are indefensible if the work is really meant to summarize knowledge of the field. Excellent as are the individual sketches, in this case the whole is less than the sum of its parts.

G. G. SIMPSON

WILD FLOWERS OF AMERICA

- - - - - by H. W. Rickett

Paintings by Mary Vaux Walcott
and Dorothy Falcon Platt
Crown Publishers, Inc., \$10.00

DR. H. W. RICKETT is perhaps best known today among his colleagues as a bibliographer in the general field of botany. He is personally known and held in affectionate esteem by some of the members of our museum staff.

In supervising the selection of exactly 400 of the fine flower paintings out of doubtless many more from the work of the two artists named above, Dr. Rickett had to keep constantly in mind the spatial limitations of the book and at the same time judiciously represent most of the plant families embraced in the geographical scope indicated by the title of the book. These considerations also guided him in preparing his text, which he was able to confine to 67 pages, plus 4 more of index. In that text more than 250 species of plants are concisely described, and an identification chart is added. The inclusion of an index to the plates would have rounded out the total plan.

We are informed in a printer's note that the paintings by Mary Vaux Walcott were originally engraved on copper and pub-

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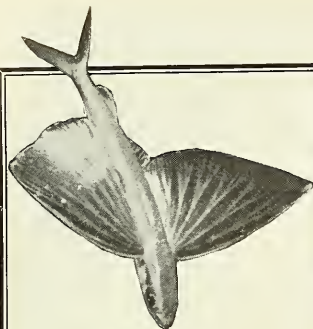
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lished in an expensive edition, but that those in the present publication as well as the work by Dorothy Falcon Platt have been done by modern lithographic methods. Doubtless most of the colors are faithfully copied. In some of the plates, at least, the colors are weak. Printers still have trouble with greens. In certain eastern species, which are well known to me—for example, in the tulip tree—the green of the reproduction falls short of the reality.

Whoever may procure a copy of Dr. Rickett's book will own a very satisfying work of art, but he must remind himself that it is chiefly art, not a compendium with which he can identify American flowers plucked at random.

G. H. H. TATE

WAYS OF MAMMALS

by Clifford B. Moore
Ronald Press Co.,
273 pp., \$3.50

IN his book on animal myths, Mr. Moore has endeavored to analyze and clarify many of the traditional beliefs, legends, and early tales about animals. We should not lose sight of the fact that the natural sciences of today were cradled in the lap of the folklore, superstition, legend, and fables of yesterday.

The author has collected a wealth of information on his subject. He has entered into its many phases from white elephants to traveler's tall tales, from weather prophets to wolf children. In demonstrating many of his theories, he has drawn freely from the works of reputable naturalists and modern science. The homing instincts of animals is perhaps a little underestimated, though it has been overdone in literature. The author debunks the role of the wolf in early history as a ferocious enemy of mankind, and he divulges that without exception every report of wolves attacking man in America has proved to be purely imaginary.

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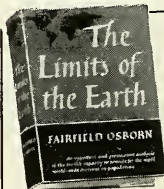
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the early history of domestic animals. For example, the Egyptians of antiquity, who dominated the civilized world for thousands of years, idolized the cat as the guardian against the depredations of rats and mice in the granaries, which contained the staple food of the people.

The author adds interest to another phase of folklore and tradition when he explains that customs are usually accepted without being understood. For some of these there is a simple explanation, such as the Easter rabbit and Easter eggs, the former signifying fertility and the latter symbolizing new life as associated with the Resurrection.

This book is more than a compilation of the pros and cons of the usual beliefs and traditions that we find in popular literature. The author, with exemplary thoroughness, examines the strange behavior of some animals such as why many species follow a leader. He has also included much natural history on a few of the unusual animals.

Ways of Mammals can be taken on its face value. The author seems to have a broad knowledge in this field, and while some of his conclusions may be open to criticism by animal psychologists, he has used considerable caution in sifting out fiction from his facts. As shown in his list of acknowledgements, Mr. Moore has had unlimited co-operation from leading zoologists and nature historians throughout America.

There is a good bibliography, an index, and footnote references to literature cited.
G. C. GOODWIN

CONVERSATION WITH THE EARTH

----- by Hans Cloos
Translated from German by E. B. Garside
and edited by Ernst Cloos and Curt Dietz.

Alfred A. Knopf, \$5.75
416 pp., 17 pl., 26 figs.

ALTHOUGH he may not always agree with Dr. Cloos' conclusions, the geologist will find this an interesting autobiography; for the general reader it is often too specialized.

F. H. POUCH

ORCHIDS OF GUATEMALA

----- Oakes Ames and
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This appears in two parts, Numbers 1 and 2, 727 pp. Vol. 26; Fieldiana: Botany,
Chicago Natural History Museum.

THIS is a scholarly, systematic treatment of the rich orchid flora of Guatemala. It is well illustrated by black and white drawings and easily the best modern report on Central American orchids. Although not likely to keep plain dirt gardeners burning the midnight oil, this publication is a must for the orchid fan.

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▲ OLD FAITHFUL LODGE, familiar to millions of tourists in the heat of the summer, lies beneath this snow. Barbara and Lela Marler are inspecting the tracks left by playful martens

SNOWBOUND

in Yellowstone

In the splendid isolation of winter, the famous Park reveals a thousand secrets that the tourist never shares

By GEORGE D. MARLER

All photographs by the author

DURING the winter of 1951-52, the opportunity came to me to stay at Old Faithful in Yellowstone National Park to study the geysers. The purpose was to determine whether the thermal intensity is as great in winter as in summer.

When this plan reached the ears of my friends, many of them quailed. The thought of many months of isolation, without the generally accepted advantages of a social existence, made such a proposition seem to them a regressive move. Personally, I was a bit curious to see whether the "benefits" of civilization would prove as indispensable as many think they are.

Following the first heavy snowfall of the season, the grand-loop road in Yellowstone Park becomes

blocked to travel, except to skis or a snowplane. No attempt is made by the National Park Service to keep the road open. Thus from five to six months of each year, the great summer recreational areas—Old Faithful, Yellowstone Lake, and the Grand Canyon of the Yellowstone—where great throngs are seen all summer, lie deeply buried in snow. In winter they are in a primitive and splendid state of isolation.

The rangers and winter-keepers

at these interior stations in the Park have to anticipate and purchase all of their needs in early autumn. Should butter, for example, be underestimated, the chances are that the bread will go bare until some time in April when the rotary snowplows break through the deep barricade and open the way to the world beyond. When you are behind the wall of snow, the grocery store around the corner seems as far away as the trading posts were



▲ THE AUTHOR'S DAUGHTER BARBARA, watching deer taking advantage of the bird feeding tray

to the Rocky Mountain trappers of a century ago.

During our sojourn behind the icy curtain, the only misgivings my family and I experienced came with the first heavy mantle of snow, which reduced the utility of our car to that of a stuffed animal. The realization that this was it—that, except for travel on foot, we were completely immobilized—gave us a strange feeling. It was something like hearing the pronouncement:

"Six months in the cooler for you!" However, I am sure our feeling was much more evanescent with a snowy barrier than it would have been behind an iron grating. Time soon softened any trepidations we may have felt.

Far from the turmoil of civilization, Wordsworth's sonnet, "The World Is Too Much With Us," had little application at Old Faithful. Nature in its varying moods was ours to enjoy; we seemed very much

a part of it. Public opinion certainly had little influence over our dress and deportment. What could our costume matter to the hungry deer at the bird-feeding tray or to the wary coyote pacing near the door in hopes of a scrap of meat?

At Old Faithful, nature is highly changeable and contradictory. The latitude and altitude of Yellowstone Park make it the coldest section in the United States. There is an official record of 67 degrees below



▲ THE HOUSEKEEPING CABINS at Old Faithful. If summer visitors ever thought the mornings were chilly, they should take a good look at this January view



▲ THE MARLERS during their winter stay in Yellowstone

zero. But, whether summer temperatures prevail or the mercury drops to the bottom of the column, boiling water eternally issues from the earth. At no other place in the world is hot water ejected to such heights into an atmosphere so cold. About the orifices of some of the hot springs, several species of plants thrive all winter, despite the frigid air and the ice and snow all around.

Anyone accustomed to Old Faithful during the tourist season, with all its bustle and ado, would surely be awed by its cemetery-like silence in winter. The moping of an owl, or


the complaining wail of a hungry coyote, seems like a dirge sounded in lamentation of man's departure. Actually, it would be closer to the truth to imagine that these sounds are expressions of satisfaction over regained dominion.

Yellowstone is celebrated as a wildlife sanctuary. But its sleek and abundantly fed animals, which literally "live in clover" during summer, are faced with the opposite situation in winter. During the summer, bison, deer, and elk scatter widely over the entire Park. But in winter, sustenance can be procured only on some of the higher wind-swept ridges and along the water courses—and what a meager fare!

In many situations the number of animals would seem to be far beyond the supporting power of the winter range. Even with normal snowfall, the majority of the well-fed animals of summer have become gaunt and emaciated by spring. The carcasses of those that do not survive this ordeal become

the happy find of scavenger birds and animals. The large mammals of the Firehole region can only survive by coming into the geyser basins during winter, where spots of warm ground greatly reduce the snow cover. The summer range is now buried beneath six to ten feet of snow. The elk and bison pass most of the winter on and near the periphery of the warm areas, but because the heat keeps the ground dry there during the summer, there is at best only a scanty cover of vegetation. To see a 2000-pound bison seeking sustenance day after day where the grass does not seem adequate to support a mouse is a pathetic spectacle.

It seems miraculous, indeed, that such great numbers of big animals survive the average winter. It is a high tribute to their stamina and resourcefulness. One cannot observe the plant-eating animals in their seasonal struggle for existence in Yellowstone Park without a deeper realization that nature can be as



▷ A COYOTE APPROACH-
ING with hair bristling
on its shoulders

▼ NEAR THE END OF THE TRAIL.
The long winter, plus a nursing
calf, proved too great an ordeal
for this cow bison



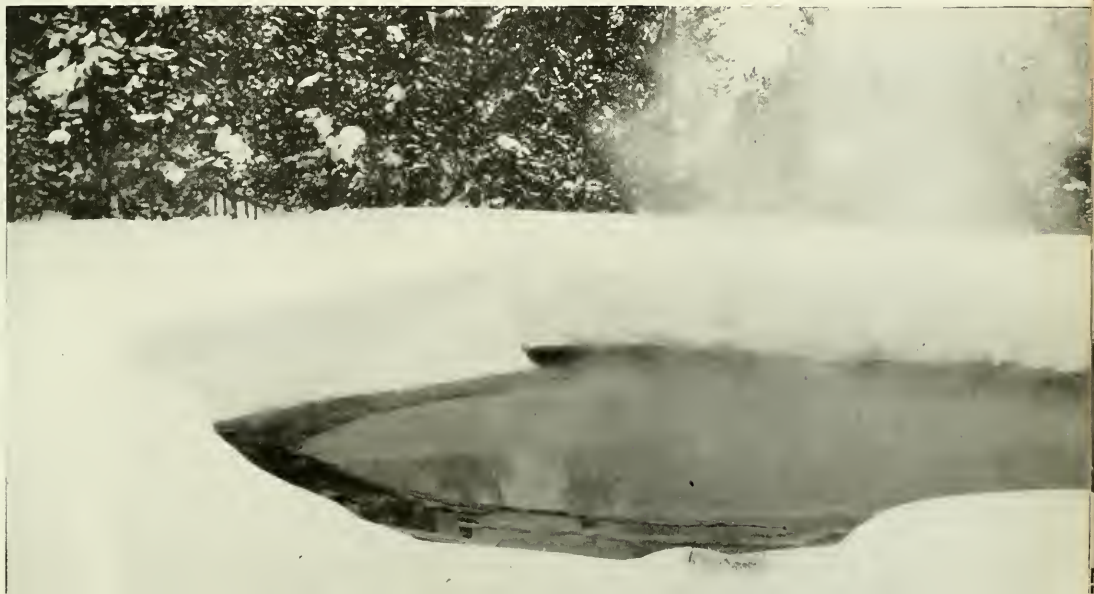
cruel as it can be gracious. Whether
to man or to beast, it presents two
antithetical facets.

The commonest small mammals

that we found about Old Faithful
in winter were snowshoe hares, red
squirrels, and martens. One squirrel
found the bird-feeding tray so

suited to his dietary needs that he
practically forsook numerous pine
cone caches he had established.
While feeding on the tray, he would
tolerate no approach from hungry
feathered intruders. The alighting
of a jay in the trees over the tray
was a signal for summary action.
The squirrel would jump from tree
to tree in the close-set lodgepole
pines in hot pursuit of the rightful
visitor to the tray. The jay would
sit quite docilely as though with
disdainful indifference until the
bundle of furry fury would get
within a foot or two. Then the bird
would deftly hop or fly to the limb
of another tree, only to be flushed

▼ THE FAMOUS MORNING
GLORY POOL in January





▲ ROCKY MOUNTAIN MULE DEER, photographed during the mating season

again as soon as the squirrel could scramble to its proximity.

This animosity toward the jays was repeated day after day. One afternoon a chase lasted for fourteen minutes. A nutcracker, which had become the anathema on this particular occasion, expended practically no energy, but the pugnacious squirrel, bent on evicting "trespassers," engaged in a pursuit that was a veritable marathon. Martens would make frequent forays to the bird tray; but on such occasions the squirrel was neither seen nor heard. Even the deer learned that the bird tray offered tidbits to their liking.

In winter, the birds and small mammals about Old Faithful fare much better than the big animals. Whether the snow is one or six feet deep makes little difference to tree-foraging birds. The niches and recesses in the bark of the conifers hold a well-stocked larder of insect eggs for creepers, nuthatches, woodpeckers, and chickadees. The pine grosbeaks and crossbills find a rich harvest of pine cone seed. Nutcrackers and Rocky Mountain and Stellar's jays, when not at the feeding tray, were largely in search of animal matter. They were ever alert

for meat. The nutcrackers particularly were not far behind the magpies and ravens in their search for a dead animal. Almost every bend of the Firehole River had, in addition to ducks and Canada geese, a pair of water ouzels. These cheerful birds vied with the chickadees in their singing propensities. We identified 32 species of winter birds, most of which were common.

With the coming of winter, the geyser basins in Yellowstone Park undergo a remarkable transformation. Except for the clustered buildings near Old Faithful, all evidences of man's artifices are effaced. The birds, "whose shining feathers shed off the cold sun," and the animals, with their crisscrossing trails through the snow, are the only evidences of animate existence.

The hot springs display the same activity that characterizes them during the summer season. Their environment, however, shows a marked change. Deep snow and ice encroach surprisingly close to the vents of some of the most active geysers. The cold atmosphere results in a much greater condensation of steam in a basin near saturation with gaseous emanations. When subzero conditions prevail, large cauliflower-like clouds of

▼ SNOW PATTERN around Castle Geyser in February. The icicles on the cone would be hard to imagine in July





steam, unfolding like an atomic explosion, rise hundreds of feet above the water column of an erupting geyser. When this arctic-air condition prevails, much of the mist and spray from an erupting geyser congeals into crystalline form before it falls, despite the high temperature it had seconds before.

On a clear morning, following a subzero night, all nature is heavily decorated with long frost crystals, giving a brilliant diamondlike luster to everything. Even the air is full of ice crystals, refracting hues like a prism. Wherever the condensing steam from the hot springs is wafted directly over the trees, it results in an ever growing encrustation of ice. These snow-mantled and ice-covered trees are not inappropriately known as "ghost trees." They give the basin an eerie and spectral appearance. When they are viewed through the many ascending plumes of mist from the hot springs, the geyser basin becomes ethereal, taking on an adornment like a

fairyland—a place of delicate and enchanting beauty. Many of the ghost trees assume shapes that are statuesque and lifelike. Could Washington Irving have but viewed the geyser basins on a cold morning in winter, his stories of goblins, spectres, wood demons, and haunted retreats might have found the ideal setting.

Mrs. Marler and I had both looked forward to the winter with spirited interest, but truly our snowed-in experience proved rich beyond our expectations. The days were not long enough to exhaust the full possibilities offered by the ever-intriguing geysers, the interesting wildlife, and the unique and elusive beauty of the work of the "elfin builders of the frost."

The ideal of preserving the great wilderness that is Yellowstone in a state of naturalness is never more closely approached than when the snow, "announced by all the trumpets of the sky," leaves the wonderland snowbound!

▲ FIREHOLE RIVER and foot-bridge leading to Geyser Hill, after a storm

▼ SPLENDID GEYSER and Grand Geyser seen through the mists in zero temperature





E. O. Hoppe photo

▲ SWARMS OF LOCUSTS descending on a plantation in East Africa

War on the Locust

Unified international efforts from West Africa to India are making progress against an insect that has plagued man since Biblical times

By B. P. UVAROV

Director of the Anti-Locust Research Centre, London

Photographs from the British Information Services unless otherwise stated



▼ THE LOCUST has a five-inch wing-spread and weighs about one-tenth of an ounce. A swarm may weigh as much as 20,000 tons and needs to eat its own weight in green vegetation daily



◀ A MASS OF LOCUST EGGS, about two to three inches long, as it was dug from the ground. The eggs, about the size of a wheat seed, can scarcely be seen here because of the adhering sand. One female lays about 300 eggs. Hatching time: ten days

▼ A TYPICAL HATCH of locusts at the Anti-Locust Research Centre in London. Vast numbers are hatched every day for use there and in other research laboratories

THE countries of the Middle East were warned that their 1953 crops were in danger from an enemy that had caused devastation many times during their long history—the Desert Locust (*Schistocerca gregaria*). The swarms were on the move. This is the same insect as is mentioned in the Bible and in the earliest Egyptian and Assyrian chronicles.

The danger was, therefore, not new. But man is no longer defenseless against the locust since, some 20 years ago, governments and scientists of a number of countries decided to work together to find an answer to the menace.

The first step in this concerted attempt was an agreement between all countries in Africa and western Asia to institute a system for reporting the movement of swarms. Reports, usually made monthly, have been sent for the last 20 years to the Anti-Locust Research Centre in London. Here they are plotted on maps and analyzed in order to find out where the swarms have originated and the pattern of their movements. It is this reporting system and the results of studying the changing picture of infestations that have made it possible to understand certain seasonal regularities in locust migrations and to forecast where to expect an invasion. The Centre issues summaries



every month describing the state of infestation in all countries from India to the west coast of Africa. These summaries include a general forecast of possible further developments.

Methods for protecting crops against the locust have also improved greatly during recent years. A great variety of machinery and chemicals have been tested, and the best and most economical ones have been adopted for general use. The most widely-used technique is directed against very young locusts. These "hoppers," which hatch from eggs laid in the sand moistened by

rain, have no wings, but they congregate in dense marauding bands and may cause devastation of crops. It has been found, however, that they are very fond of wheat bran, and when bran mixed with poison is scattered thinly on the ground in front of an advancing band of grasshoppers, they feed on it and die.

A number of chemicals for such poison baits have been tried. One of the best is benzene-hexachloride, a synthetic substance that has proved to be deadly to locusts but not to domestic animals. The same and other poisons are used direct, either on young or fully grown

locusts. The insects are dusted or sprayed by means of special machines ranging from small ones carried and worked by one man, to large powered types mounted on motor vehicles.

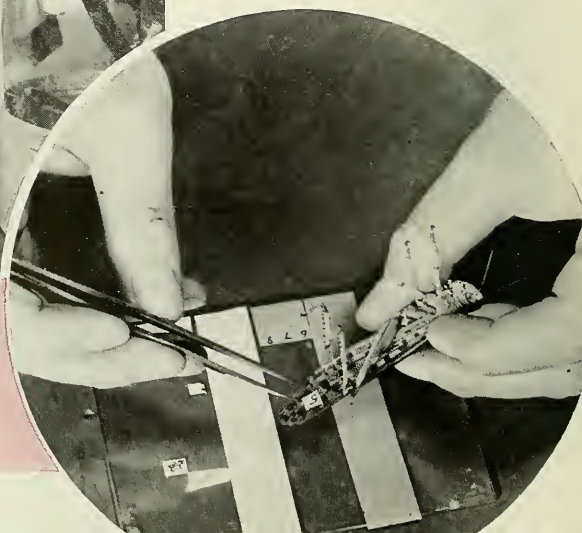
However, it is not enough to have effective anti-locust weapons; there must be an efficient organization to apply them. Modern anti-locust campaigns require careful planning by experts, abundant motor transport, supply bases, and trained technical personnel. One of the national organizations of this kind is the British Desert Locust Control, based at Nairobi, in East Africa. This organization has at its disposal over 400 motor vehicles, about 100 technical officers, and operational bases distributed strategically over East Africa, the Somalilands, Ethiopia, and Arabia. This effort by Britain aims largely at protecting the valuable crops of East Africa by killing locusts well beyond its borders. The operational costs average about £1,000,000 a year, but the money is well spent as there have been no great losses from locusts during the recent plague in East Africa itself, and other countries have also benefitted.

Similar anti-locust services exist in other countries—Pakistan, India, Iran, Sudan, Egypt, Jordan, and elsewhere—and, on the whole, they are holding their own against the invaders. The wide ranging migra-



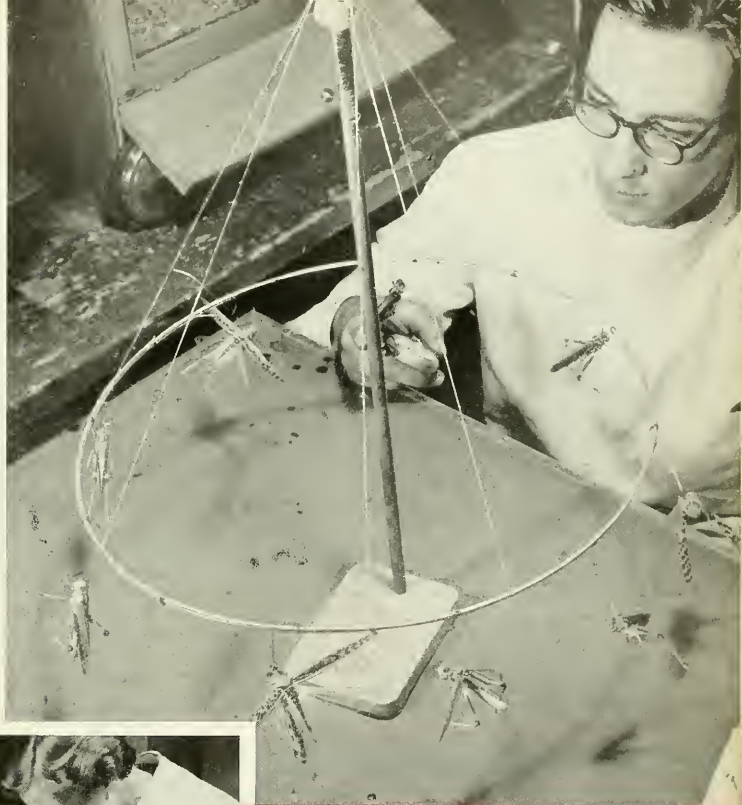
▲ LABELING A LOCUST for identification in an experiment. Careful handling is needed to avoid damage

➤ A NUMBERED SQUARE of colored paper is used for marking the insects



tions of swarms, however, make it essential that such national efforts be co-ordinated, and in this respect the Food and Agriculture Organization of the United Nations has taken the first step to ensure unity among the countries threatened by the common enemy. An advisory committee consisting of expert representatives of the more active countries has been set up to discuss and co-ordinate national campaign plans. During the last year, remarkable progress was achieved when several countries sent their motorized teams of locust fighters to Arabia, where they worked side by side with excellent results.

Much has been achieved recently by man in his struggle against locusts, but these practical achievements are based on years of patient research. This is one of the cases where research is beginning to pay, and it is to be hoped that the progress will not stop until the locust menace becomes only a memory.



▲ THIS APPARATUS, though it looks like a child's toy, is being used for estimating speed and duration of flight. Only about half of the insects seem to be active. Flight speeds of insects are difficult to ascertain. Some of the best estimates have been made from moving automobiles



▲ OBSERVING the feeding habits of young locusts. One locust occupies each glass

➤ ABOUT 1000 REPORTS on the movements and breeding of locusts are received every year at the Anti-Locust Research Centre. They are plotted here in the Geographical Section. Every month, the Centre issues a summary of conditions and a forecast of expected invasions





N. Y. Zoological Society photo

▲ SOUTH AMERICAN ELECTRIC EELS (*Electrophorus electricus*). They can cause death to a horse—without causing themselves discomfort

Electric Fishes

When the explorer Alexander von Humboldt saw two horses drowned by electric eels, science was on the path to the electrocardiograph and the instrument for measuring brain waves

By N. J. BERRILL

McGill University

ALL life is electrical. Electricity cannot be divorced from the nature of living matter itself, plant as well as animal. And the more active a creature is, the greater the electrical flux that goes on within it. We use machines now to record brain waves, — living electronics, — and for a long time past we have measured the rhythms and amplitudes of the electrical discharges of the heart, which to a skilled reader is like seeing the heart in a mirror. Every twitch of a muscle comes from the electrical stimulus of a nerve and itself creates an electrical disturbance. But there are

some animals, all of them fishes of a sort, that carry an excess of electricity for the benefit, or I should say the discomfort and maybe the death, of others.

The beginnings of the story go back a long way in time, and in more ways than one, for two of the fishes inhabit the ancient cradle of civilization, and another is a pre-fish. The catfish of the Nile and the Torpedo Ray of the eastern Mediterranean both possess electric organs, and so did some of the Devonian fossil Ostracoderms, extinct relatives of our lampreys and hagfish. I expect that fishermen have

been literally shocked by the catfish and the ray since first they threw their nets into the sea. Their uncanny power must have evoked both fear and superstition.

Yet it is curious, I think, that the first-known Egyptian work to speak of the electric catfish comes from the fourth century, although the fish itself is pictured on the walls of Egyptian tombs as early as the Fifth Dynasty, about 2750 B.C. Perhaps when all nature was the supernatural personified, a few shocks from a fish were merely a little more of the same thing. However it was, the earliest written

record of the fish is not Egyptian but Greek, appearing in a book possibly written by Hippocrates himself. The torpedo ray you can find in Plato's dialogues, where he says to Socrates, "If I may venture to make a jest upon you, you seem in your appearance and in your power over others to be like a torpedo fish, who torpifies those who come near him and touch him, as you have now torpified me, I think." And in the *Historia Animalium*, the first textbook of zoology ever to be written, Plato's pupil Aristotle writes, "the torpedo narcotizes the creatures that it wants to catch, overpowering them by the power of shock that is resident in its body, and feeds upon them; it also hides in the sand and mud, and catches all the creatures that swim in its way and come under its narcotic influence."

But we have to wait for Rome and the orator Cicero to hear that the fish uses its electric shocks as a weapon of defense. Another

Roman, Claudian, wrote, "Who has not heard of the invincible skill of the dread torpedo and of the powers that win its name?—Should it carelessly swallow a piece of bait that hides a hook of bronze and feel the pull of the jagged barbs, it does not swim away nor seek to free itself by biting vainly at the line but artfully approaches the dark line and, though a prisoner, forgets not its skill, emitting from its poisonous veins an effluence which spreads far and wide through the water. The poison's bane leaves the sea and creeps up the line; it will soon prove too much for the distant fisherman. The dread paralyzing force rises above the water's level and, climbing up the drooping line, passes down the jointed rod and congeals, e'er he is ever aware of it, the blood of the fisherman's victorious hand. He casts away his dangerous burden and lets go his rebel prey, returning home disarmed without his rod."

It is easy to assume that the shock

New York Zoological Society photos

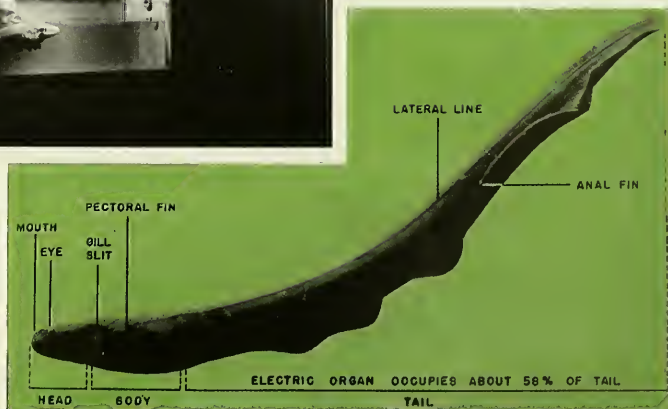
had much the same general meaning then as now, yet more than a thousand years had to pass before recognition of its electric nature may be said to have been made. And frankly, I think it is a brave man even now who will confidently state what electricity truly is!

You do not have to understand the nature of electricity or even recognize the sameness of lightning and fish shocks to feel the effects, and Roman physicians certainly employed electrotherapy in practice, if not by name. Scribonius appears to have been the first: "For any type of gout, a live black torpedo should, when the pain begins, be placed under the feet. The patient must stand on a moist shore washed up by the sea, and he should stay like this until his whole foot and leg up to the knee is numb. This takes away the present pain and prevents pain from coming on if it has not already arisen. In this way Anteros, a freedman of Tiberius, was cured,"—and, "headache, even if it is unbearable, is taken away and remedied forever by a live black torpedo placed on the spot which is in pain, until the pain ceases." After the Romans it was the turn of the Mohammedans, and in the eleventh century we find their doctors using live electric catfish in the same way for persons suffering from epileptic fits. As a matter of fact, the catfish has also been used by various tribes in Africa from time immemorial to



▲ THE DEMONSTRATOR has to wear rubber gloves when handling the electric eel

➤ FULLY FOUR-FIFTHS of the electric eel is tail, and over half of the tail is occupied by the electric organ



cure pain or to chase out devils.

In the end it is neither of these fishes that is the most impressive or the most informative but rather the electric eel of the great South American rivers. For knowledge of this, we had to wait for the discovery and occupation of South America by Spain and Portugal, and longer. It was not until late in the eighteenth century that the electric eel really made the news, and then it came from the Dutch colony of Surinam. But electric or not, you cannot hold a large live eel to any particular spot, nor can the electric eel be handled at all with impunity. One of the standard medical treatments in the colonies seems to me to have been extremely drastic, although apparently effective. Young slaves afflicted with either paralysis or fever were thrown into a tub of water in company with an eel. It was shock treatment certainly! And towards the end of the century many specimens of the fish, *Electrophorus electricus*, as it is now called, were exhibited in Europe. Benjamin Franklin had already demonstrated that lightning and man-made electricity were one and the same, and shock treatment was advertised in London at half a crown per shock. The torpedo probably was the fish that was used. Franklinism, whether the electricity was fish or man-made, became the fashion of the day.

To my mind, the most interesting encounter of a man with an electric fish was that of Alexander von Humboldt in the year 1800. It came during what in many ways is one of the most fascinating journeys ever made. He and his botanist-companion Bonpland had left the Paris of the new revolutionary republic the year before, and to their own astonishment were given passports by Spain to explore her American colonies. For 300 years the way had been barred, and these were the first non-Spanish Europeans to make a legal visit. From Caracas the travelers took their way across the high hinterland of Venezuela and approached the Orinoco through the back door,

so to speak,—traversing the hot, dry plains of the Llanos until they came to Calabozo, a little lost settlement north of the Apure River. This was but the beginning of their long journey by water to the headwaters of the Orinoco and through the mysterious Casiquiare to its junction with the Rio Negro and the mighty Amazon. Yet it was in this little town of exiles that electricity took them unawares.

You have to realize, I think, the scientific circumstances of the times and the up-to-dateness of Humboldt's equipment and preparedness. Oxygen, for instance, had only recently been recognized for what it is and given its name, yet Humboldt came prepared to analyze the gas in the air bladder of fishes. His was virtually a one-man scientific, physiological expedition thousands of miles from home into one of the wildest parts of the earth. He brought with him all the new apparatus of Europe for the measurement and manufacture of electricity, and a host of other things. Nothing was further from the mind of this most enterprising and brilliant young man than to find already existing in the wilderness, apparatus almost identical with what he brought with him.

"We found at Calabozo," he said, "in the midst of the Llanos, an electrical machine with large plates, electrophori, batteries, electrometers; an apparatus nearly as complete as our first scientific men in Europe possess. All these articles had not been purchased in the United States; they were the work of a man who had never seen any instrument, who had no person to consult, and who was acquainted with the phenomena of electricity only by reading the treatise of De Lafond and Franklin's memoirs. Señor Carlos del Pozo, the name of this enlightened and ingenious man, had begun to make cylindrical electrical machines, by employing large glass jars, after having cut off their necks....I had brought with me electrometers mounted with straw, pith balls, and goldleaf; also a small Leyden jar, which could be charged

by friction according to the method of Ingenhousz and which served for my physiological experiments. Señor del Pozo could not contain his joy on seeing for the first time instruments which he had not made, yet which appeared to be copied from his own. We also showed him the effect of the contact of heterogenous metals on the nerves of frogs. The name of Galvani and Volta had not previously been heard in those vast solitudes."

"Next to his electrical apparatus," Humboldt went on, "nothing at Calabozo excited in us so great an interest as the gymnoti, which are animated electrical apparatuses." In the end, the experimenters had to go to the streams wherein the eels lived, in order to make their experiments, basins of muddy water surrounded by fragrant mimosa and other fine trees. No nets could catch the fish, for the eels burrowed too quickly into the mud, and the system used to catch them was to drive wild horses into the pool. "The extraordinary noise caused by the horses' hoofs," Humboldt observed, "makes the fish issue from the mud and excites them to attack. These yellowish and livid eels, resembling large aquatic serpents, swim on the surface of the water and crowd under the belly of the horses. The eels, stunned by the noise, defend themselves by the repeated discharge of their electric batteries....In less than five minutes, two of our horses were drowned. The eel, being five feet long and pressing itself against the belly of the horses, makes a discharge along the whole extent of its electric organ. It attacks at once the heart, the intestines, and the abdominal nerves....We had little doubt that the fishing would terminate by killing successively all the animals engaged; but by degrees, the impetuosity of this unequal combat diminished, and the wearied gymnoti dispersed. They require a long rest and abundant nourishment to repair the galvanic force which they have lost. The horses appear less frightening; their manes are no longer bristled, and their eyes ex-



After J. F. Blumenbach, 1810

◀ THE ANCIENT GREEKS believed that it was bad luck to dream of a torpedo fish swimming among other fishes, as depicted on this dish



After Count A. L. J. de Laborde

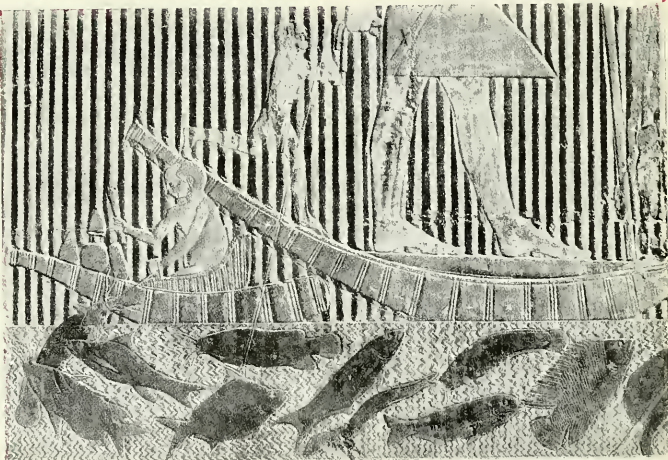
➤ AN EARLY ATHENIAN representation of the torpedo fish

press less dread. The gymnoti approach timidly the edge of the marsh, where they are taken by means of small harpoons fastened to long cords. When the cords are very dry the Indians feel no shock in raising the fish into the air. In a few minutes we had five large eels, most of which were but slightly wounded."

Here occurred some of the most remarkable physiological experiments ever made, when you consider that it was over a century and a half ago, on the bank of a stream a thousand miles from the mouth of the Orinoco, beneath an equatorial sun. Humboldt analyzed the air in the swim bladder and found it to be four parts of oxygen to ninety-six of nitrogen, and then went on to the electrical phenomena. One of these experiments was informative but unintentionally so:

"I do not remember having ever received from the discharge of a large Leyden jar a more dreadful shock than that which I experienced by imprudently placing both my feet on a gymnotus just taken out of the water. I was affected during the rest of the day with a violent pain in the knees and in almost every joint. . . . We seem to feel at every stroke, an internal vibration, which lasts two or three seconds and is followed by a painful numbness."

Humboldt discovered that the electric eel concentrated its electric discharge at the point where it was most strongly irritated. "An electrical eel was brought to me at Calabozo; it had been taken in a



After Gaillard, 1923

▲ THE ELECTRIC CATFISH (*Malapterus electricus*) is seen on this bas-relief from Sakkara, Egypt, directly behind the boating pole

▼ THE ELECTRIC CATFISH in the flesh. Its batteries have been developed out of glands lying just beneath the skin

New York Zoological Society photo



net and consequently had no wound. It ate meat and terribly frightened the little tortoises and frogs which, not aware of their danger, placed themselves upon its back. The frogs did not receive the stroke until the moment when they touched the body of the gymnotus. When they recovered, they leaped out of the tub. . . . On cutting a very vigorous fish through the middle of the body, the forepart alone gave shocks." Humboldt observed that the most violent muscular movements were not always accompanied by electric discharges. He also found that when two persons formed a circle, one holding the tail and the other the head, they could not force the gymnotus to deliver its charge. "The electric organ fills the greater part of the body," he said, "and this organ is slimy and disagreeable to the taste."

Humboldt went on to make a prophecy: "The discoveries that will be made on the electromotive apparatus of these fish, much more energetic and more easy of preparation than the torpedos, will extend to all the phenomena of muscular motion subject to volition. It will perhaps be found that, in most animals, every contraction of the muscular fibre is preceded by a discharge from the nerve into the muscle; and that the mere simple contact of heterogeneous substances is a source of movement and life in all organized beings. Did an ingenious and lively people, the Arabians, guess from remote antiquity, that the same force which inflames the vault of Heaven in storms, is the living and invisible weapon of inhabitants of the waters?"

Since Humboldt's time, which seems remote and yet is not, much of what we know of the nature of the eel's electric discharges comes from studies made by Christopher Coates on eels kept in captivity in the New York Aquarium. Two features seem to me to be more startling than the rest. One is the speed at which the discharge passes along the body,—at the rate of about a thousand yards a second. This is

slow compared with the speed of an electrical discharge passing along a wire, but it is almost ten times as fast as the fastest passage of a nerve impulse along the nerve of a warm-blooded animal. It is a curious phenomenon, because the electric organ itself seems to be essentially a modified form of muscle plates and the discharge plates of motor nerve endings.

There is a theory for the evolution of the electric tissue, although it is based more on what we know of embryos of the electric ray than of the eel itself. Here certain muscle fibers, in other rays destined to become part of the lateral muscles used in swimming, shorten and thicken as they mature until they become units called electroplaxes. These are small electric cells, which operate much as do those in a flashlight battery. A nerve impulse from the brain passes down to the cell but no longer brings about a muscle contraction. Instead it makes a path for the electric current to flow from one cell to the next. And when all the cells at once pour their electricity into this current, a great release of power takes place.

I said before that the current travels at about 1000 yards a second. This is the mean value, and actually it goes at 2500 yards a second at the front end but slows to a mere 450 yards a second in the tail. How it is accomplished we have yet to discover. The charge that the fish is capable of is certainly nothing to sneeze at. Any eel that had only 300 volts, unless it were a baby, would be considered a pretty sick one. Even a baby eel can give you a 120-volt shock, although it won't light up an electric lamp, not because it isn't strong enough but because the current simply isn't there long enough to heat the filament.

Yet, like the decrease in speed from head to tail, the voltage per inch of eel also decreases, and to comparable extent, from 25 per inch in front to 5 volts to the inch in the tail. We have a clue to the explanation, because the cells or electroplaxes, all of which have indi-

dually the same voltage, (almost one-seventh of a volt), get larger toward the tail and therefore fewer to the inch. In the head they are short, are many to the inch, and consequently their combined voltage is high.

Even this is not quite all, for there are three divisions of the electric organ, and the eel can discharge one for a major shock, one for a minor, and one for an intermediate, though it is not certain that the intermediate one is under the fish's control.

So much for the eel, although in the end we are left with more to wonder about than we have been able to answer. Both eel and torpedo have apparently made electric organs out of swimming muscles. The electric catfish on the other hand appears to have made its electric batteries out of glands lying just beneath the skin, leaving its muscles intact.

Two more fishes remain, though we know less about them. One is the stargazer, sometimes found on the Atlantic coast as far north as Chesapeake Bay, perhaps the strangest of them all. Its sight is presumably as good as ever, but it cannot move its eyes, for it has evolved its electric organ out of the eye muscles themselves. The eyes are fixed and look perpetually upward, but at least it can say, as no other creature truly can, "I gave him an electrifying glance!"

The other is a relative newcomer that has only recently yielded some of its secrets to science. It is a little fish from West Africa known as *Gymnarchus niloticus*, and it swims forward and backward with equal ease. One of them recently was sent to Dr. Lissmann at the University of Cambridge, who became intrigued both by a curious organ in the fish's finger-like tail and the skill shown by the fish in avoiding obstacles when swimming backward. Perhaps it was employing a natural radar system. And as far as one lone lost individual *Gymnarchus* could tell us, this seems to be true. A pair of electrodes connected with an oscillograph were placed



N. Y. Zoological Society photo

◀ THE ELEPHANT SNOOT FISH (*Mormyrus kannume*) whose electrical equipment serves it like a radar set

in the water, the fish fled from it, but when its own pulses were fed back into the water it attacked the electrodes as though, perhaps, they seemed to be a rival of the same species! And there the story ends, for the excitement was too much and the little fish died.

We have one more candidate for electric honors, but this time it no longer exists and is not even a fish. The modern lamprey, which at present is a great pest in the Great Lakes, is an aquatic vertebrate it is true; but without paired fins or true jaws, it belongs to a group that stopped short of the status of true fishes. We find fossil members of the same group as far back in time as the Ordovician period, before the real fishes had evolved,—as bottom-living armored vertebrates known as Ostracoderms. The better known forms came from a somewhat later period, the Devonian, about 300 million years ago, when fish as such had also come into being. Perhaps it was this very fact that put the conservative Ostracoderms on the defensive, for certain of them evolved electric organs in either side of the head,—“Touch me not, or I’ll shock you!”—for it’s difficult to imagine an Ostracoderm needing electric organs for any aggressive purpose when it had no jaws to follow up its action.

What has always fascinated me, however, is not so much the discovery that an ancient Ostracoderm possessed electric organs very much like those of the modern torpedo;

it is the manner of the discovery itself. I was working at the University of London when the photographs began to arrive, and it was this way.

The larger fossil specimens of Ostracoderms were for the most part crushed flat by the tremendous pressures of the rock, but Professor Stensio of Sweden found some very small fossils in the sandstones of Spitsbergen, which had pretty well retained their original shape. To

decipher their internal structure, he devised a beautiful technique. It consisted of grinding the tip of the fossil and photographing the polished surface under oil. Then another fraction of a millimeter was ground off, and the new polished surface was photographed in the same way. This went on until the whole of the fossil had disappeared as dust, but in its place existed a whole series of photographs, each one representing a very thin section through the fossil, only greatly enlarged. The photographs, surprisingly, showed not only details of the fossilized skeleton but also the fossilized paths of nerves, arteries, muscles, and other originally soft tissues. And among the structures and tissues that Stensio succeeded in reconstructing from his photographs were organs unmistakably similar to those of our living electric fishes.

a new electric fish

THE so-called Elephant Snout Fish has been found to possess an electrical organ in its tail and a receiving mechanism near the base of its dorsal fin. This apparatus may operate somewhat like radar, according to an announcement in a report of the East African Fisheries Research Organization. The electrical organ in the tail has been found to emit electrical impulses at a rate of between 30 and 100 a minute except when resting. Only about six volts are developed.

It was not at first clear what purpose the organ might serve. However, it was noticed that the fish was extremely sensitive to the presence of other fishes in its neighborhood or to any electrical conductor, such as a length of wire, placed near it. This led to the conclusion that the fish must be able to perceive disturbances in its own electrical field and must therefore possess a receptor mechanism as well as one for transmitting impulses.

Paired branches of cranial nerves were found running along the back, and small branches from these terminated at regular intervals close to the base of the dorsal fin. When these two nerves were cut near their origin, the fish became less responsive. It seems that these nerves are concerned with the assessment of the fish's own electrical field and the disturbances in it. It has been thought likely, therefore, that this fish possesses a device bearing some resemblance to radar, with which it can detect the presence of objects in its neighborhood by the “bounce-back” of an electrical impulse.

It is interesting to note that a warning device such as the Elephant Snout appears to possess should have considerable survival value. The fish lives on the bottom of the lake and feeds on larvae in the mud. When so engaged, it can have little chance of seeing the approach of enemies.

A person equipped with suitable apparatus, earphones, etc., can “listen” to these fish while they are on the bottom of the lake. The report suggests that the fish occurs in large numbers in some localities and that by some such method as this the concentrations might be located and utilized to form the basis of a new industry.

If fishes had wishes, friend Elephant Snout might therefore prefer to turn in his out-moded radar for something still another jump ahead of man.

—Ed.

Assignment *Amazon*

IN THE PRECEDING INSTALLMENTS:

On a one-man expedition to find and interview an explorer who has lived many years in the interior of Brazil, the author met and traded with wild Chavantes southwest of the frontier settlement of Chavantina. Having missed Orlando Vilas Boas by a few hours in the headwaters of the Xingu River, he has joined a group of Camayura Indians traveling to their village.

By

EDWARD WEYER, JR.

Editor NATURAL HISTORY Magazine

All photographs by the author

Part III:

OUR trip through the swamps and over the blazing upland west of the Kuluene River had tired the Indians almost as much as me. But when we finally paddled up to the village on the east shore of the lake that the Camayuras call Ipavu, the sight of those clean,

healthy, happy Indians, wading and swimming to greet us made my spirits soar. I followed the chief's son, Tah-Koo-Mah, onto the dock of palm logs.

"These are my family," he said in Portuguese, leading me to his mother, a brother, and two sisters.

We patted each other, smiling. These Indians had seen outsiders elsewhere, but they told me a second time that I was the first white man to visit this village. Across the lake they pointed out another village, and they also spoke of a third and a fourth, now empty I gathered, farther south around this side of the lake.

A hundred yards up from the water's edge you could see the tops of the thatched huts. The men were carrying my goods up the path, and I followed them. Around the clearing there were five large oval huts, four rectangular ones, and several open shelters for shade. Here other Indians came forward, and I made the rounds, patting and being patted. They all had thick, black hair. No one in the village was either bald or gray. Some of the women felt the light-colored hair on the back of my hand and drew the attention of others to it.

Tah-Koo-Mah said, "Let me take your hammock," and he disappeared with it into the central hut. He had told me there were 35 people

◀ **TYPICAL SCENE** in a Camayura village. The girl is scraping manioc with a shell. Hammocks are slung in the background between the supports of a hut whose walls have been left open during the dry season





◀ Koo-Yah-Yoo, daughter of a Camayura chief, spreading the grated manioc on a palm-fiber sieve. This is the bitter manioc, which contains prussic acid and is poisonous until processed in this manner

▼ WRESTLING is a lively sport among the Camayuras, and the intertribal champion enjoys great distinction. The bout begins with the wrestlers circling each other in a crouching position, shouting, "Huka-huka-huka." The tactics are quite similar to our own. The purpose is to throw one's opponent on his back



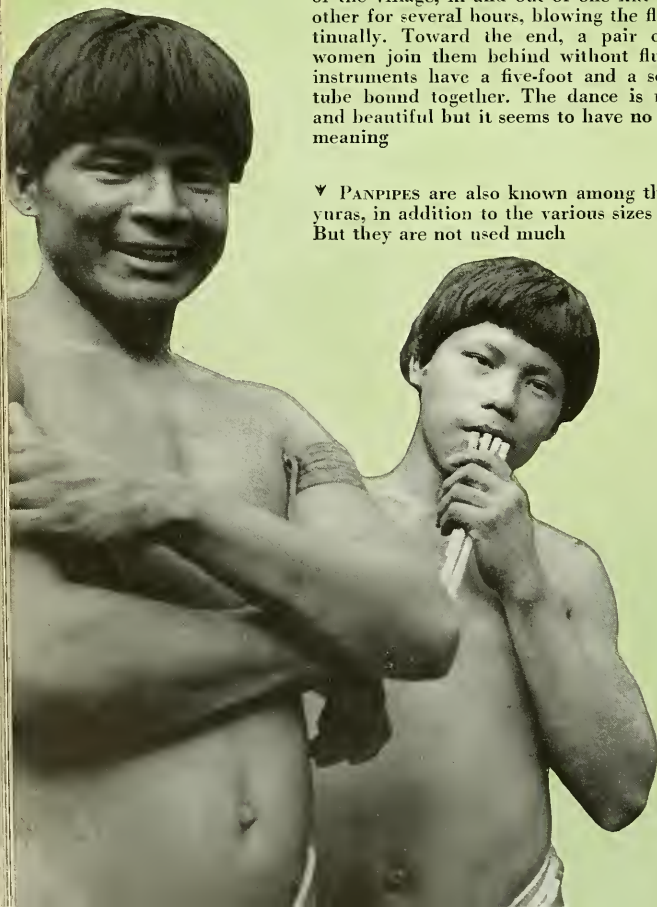
▼ EVEN THE ADOLESCENT GIRLS learn to prepare the flour from the tuberous root of the manioc. The large pots are sometimes a yard across. The Camayuras get most of them through trade with the Waura tribe to the southwest





▲ GIGANTIC FLUTES are the feature of this dance, the uruá. The two men make the rounds of the village, in and out of one hut after another for several hours, blowing the flutes continually. Toward the end, a pair of young women join them behind without flutes. The instruments have a five-foot and a seven-foot tube bound together. The dance is rhythmic and beautiful but it seems to have no religious meaning

▼ PANPIPES are also known among the Camayuras, in addition to the various sizes of flutes. But they are not used much



in his village, but I counted 60 at one time, and there may easily have been 70. All the people on this lake were of the Camayura tribe (pronounced Kam-a-yoo-RAH).

Soon he came out and said I could take my stuff in. The hut was about 17 by 23 feet, with a door in the middle of each side. Bows and arrows in great number were leaning against the wall. On racks overhead near the thatching of the roof were baskets and other objects. Tah-Koo-Mah had strung my hammock between two of his sisters. One was married and had a small baby. The other was unmarried and was an unusually beautiful Indian. Her name was Koo-Yah-Yoo.

I was thrilled to be in a region that but a few years ago only the most spirited explorer would have thought of entering. I leaned my canoe paddle against the wall and piled my duffle bags under the head of my hammock. Then I got out my cooking stove and an envelope of dehydrated food. Colonel Fawcett, who was killed near this spot, had offended the Indians, we are told, by refusing to eat with them in their huts. I didn't want to appear choosy about their foods, but I also did not want to give trade goods for food instead of for Indian objects, which I was collecting for the American Museum.

Some of the men went out to fish, and soon the women were offering me tidbits—a choice little pancake, a delicious white sweet potato. This was clearly a ritual of hospitality. I accepted them and made up a sugary fruit drink from dried materials. They would have drunk gallons if I had had the makings. They were freely curious about everything I had. Once when I smiled, a man put his hand into my mouth to feel some gold in my teeth.

Koo-Yah-Yoo, in the hammock next to mine, watched every move I made. She was much interested in my tiny stove, which burned kerosene under pressure and gave great heat. Every time I looked at her, she gave me a smile, probably saying to herself, "If I had a fire machine like that, I bet I could make



◀ A CANAYURA in special dress. The feather headdress and arm band are only occasionally worn. The many-stranded cotton belt would be used when dancing or wrestling. The shell necklace and leg wrappings might be worn on almost any occasion

➤ POSSIBLY a productivity dance. The postures of the leaf-covered arms remind one of bird dances among our North American Indians, but apparently the dancer represents a tree. The skirt is of palm fiber, and the headdress is gaudy with yellow and blue feathers



▼ A CEREMONIAL DANCE in which the dancer wears a large gourd over his head with wicker ears

something better to eat than that mess." I told her brother that I wasn't used to cooking because my wife did it at home as is the custom in our land.

It was fine to be able to carry a two-week's supply of dried food in only ten pounds, but the packaging was wrong for a one-man expedition. The packages were all for four persons. I had brought plenty of tape for sealing the envelopes after using part; but don't try it. You either get all of the salt in one portion or none of it. I ended up cooking enough dried beans and banana custard for four men and eating it all at one sitting. At that, I lost 18 pounds on the expedition. The potato pancakes might have been good, but the packages gave you nothing to grease the pan with, and I hadn't time or energy to hunt for turtle eggs, which might have given satisfactory oil. Not having been able to find "instant" coffee in Rio, I had not brought any at all.

All the time that I was cooking this first meal, Indians crowded around to stare at me. I really lost standing when I tried to make biscuits. Using one of the fires in the hut instead of my stove, I made a rough oven out of the tin-foil envelopes. Whether it was because I grew up in western Pennsylvania where they make steel by the open-hearth method, I don't know. But

I turned out ingots instead of biscuits. Since my food was limited, I ate as many of them as I could. It proved only one thing—that it is not in these Indians to make fun of a visitor. Perhaps the Canayuras still think that the white man prefers his bread burned.

The two-foot pancakes of manioc that Koo-Yah-Yoo made were truly delicious. You may think that hunger makes anything taste good when I tell you that they were flabby and semielastic, somewhat like tripe, and that chewing them reminded you of eating a thin rubber sponge that had not been fully vulcanized. But they had a fascinating flavor, and my mouth waters to think of them.

I was finishing my only meal of the day when the men burst into the hut and dropped a great many fish on the earth. These were about a foot long and three-sided in cross section. They laid some in the embers of the fires and put others into large pottery bowls outside for boiling.

Darkness came almost before I could find my flashlight, and I never felt so closed in by blackness. Outside, some of the men were shouting and chanting around a fire in the center. Inside the thatched hut, fires were burning between each two tiers of hammocks to drive out the chill, and I could see that most



of the hammocks had Indians in them.

I took off my clothes, but before getting into my hammock I took my hunting knife from my belt and my pocketbook from my pocket so I could sleep with them under me. The pocketbook held all my get-home money. It cannot be denied that in darker days a number of white men have lost their lives in this region. Colonel Fawcett and his two companions had been killed, and in searching for them so had the California journalist Albert de Winton, whose bones lay at the bottom of this very lake. More recently, a group of sixteen, including five Americans, had been wiped out to the north of here; and others. But when I guarded my pocketbook, imagining how dearly I would make anyone pay for whatever he tried to take, I now know I was twice guilty of poor reasoning. What good would my hunting knife be when I had decided not to carry a gun because it would be useless while I slept? And why should I have guarded my money so anxiously? I had spent weeks buying the kind of trade goods that careful thought and good advice assured me would be most wanted by these people—fishing line, hooks, bead necklaces, combs, mirrors, and many other articles. These things were piled loosely against the wall of the hut for any prowler to loot, while I bravely guarded some paper money that wouldn't buy anything.

The idea that I might lose my belongings grew out of what I had heard, not what I had seen. People who had had experience in the region, though I doubt they had broken through the wall that often separates civilized people from natives, had told me the Indians would rob me if I let them. As every explorer knows, the native does not usually steal from his own people but only from the enemy tribe or from the stranger. I'm sure it made a great difference that I had been invited to visit this village. Without going into all the little ways in which the visitor can preserve his welcome among a people different

from himself, I can say with certainty that his position as a guest is his most valuable possession.

I have always been impressed with the motto a friend of mine has on his coat of arms: "All countries are homeland to a brave man." Courage draws admiration wherever we see it. Yet I believe I would put more faith in the motto: "All countries are homeland to a sympathetic man," especially if with sympathy is linked an understanding of local courtesies. Of course, there are all kinds of courage, loud and soft, so perhaps the talk shouldn't end here. But it certainly took no courage to live with these wonderful Indians. And why that is true, I'll be able to explain more fully in the next article of this series, when I tell you about Orlando Vilas Boas, a man whose courage and sympathy have made themselves felt far and wide over one of the wildest parts of the earth.

From first to last, the Camayuras gave me no reason to worry about how they would treat me. Only once during my journey did an Indian try to steal from me, and he was of another tribe. What I said to him, incidentally, didn't come out of Emily Post or Dale Carnegie either.

Before tossing my pocketbook into my hammock, I saw in it a lone ten-cent piece—the one I hadn't dropped into the subway turnstile at Times Square that last day in New York when I took a taxi instead. In a strange way, that coin made me realize more sharply than anything else how far I had come. I never felt farther from home in my life.

I have told before how entering the life of a people like these is like having your main switch pulled. The scene in the hut, lighted dimly by the fires, might have been in the Stone Age. The Indians were talking and laughing in their hammocks. The mothers were swinging gently with their babies. Now and then, one would warm her child by blowing her breath on it through her teeth with a hissing sound. No one wore clothing. Some had dozed off, and once in a while I could

hear someone talking in his sleep.

I found a strong beauty in this jungle hut, with its hammocks and people and timeless tools of living. I have rarely felt more at peace than I did there in my hammock on the shore of Lake Ipavu, where people I was beginning to admire greatly were not paying the slightest attention to me. I drifted off to sleep with the feeling that my soul was being fed.

The beauty of the scene was undoubtedly sharpened by the thought of changes that were sure to occur as soon as our civilization gave these people the privilege of wearing our cast-off clothing and eating out of tin cans.

It was barely light when I awakened to see Koo-Yah-Yoo in the doorway of our hut pouring water over herself from a gourd. Next, the young men of the village came in, dripping and glistening from their morning swim. The new day was typical of all that followed.

After bathing in the lake, I swam out to deep water; filled my canvas bucket, and brought it in for boiling. I then shaved and made breakfast. It was chilly in the early morning. Without fires in the hut, sleep would have been impossible, and it was good to get into my clothes. During the heat of the day, I was glad to take them off, and the In-



dians didn't seem to notice whether I had them on or not.

It took so long to boil my water, make breakfast, and wash my dishes that I was content not to think of another meal until late afternoon. I bear the details of camping as a necessary evil. For fully six weeks now, I had washed all my own clothing, and I was getting tired of it.

A woman brought me an ailing child and that started it. That first morning I examined and treated four children with temperatures that ranged from 101.5° to 105.6° with the thermometer under the arm. I was afraid that the 105.6° baby was almost dead. Her eyes

were glued shut with infection.

I am not a medical doctor, but I had a good assortment of drugs. I tried to tell the Indians how ill this child was, for I didn't want to be blamed for her death. The mother only stared at me like a frightened animal, but when I measured the antibiotic powder, she mixed it with her breast milk, and we fed it to the baby from a gourd spoon. I examined my patients every four hours.

From noon to three o'clock was always the hard part of the day for me, largely because of the heat. I usually slept some in my hammock, which was easy, because the nighttime revelries around the campfire

often went on nearly till dawn.

The men and women worked separately at their jobs. While a wife was processing manioc, her husband might be making an arrow, but not by her side. There was little social interchange between the sexes during the day. The people came right out with their feelings toward me. Sometimes I would feel someone



▲ INSIDE A HUT, showing a few of the many hammocks that crisscross the space at night. The boy at right is reaching into a plastic bag the author gave him. Waterproof containers were highly valued for use in the canoes

➤ SORTING the palm fibers for the hammock being made in the background for the author. The crosswise stands are of cotton, which the Camayuras grow for the purpose. Behind the man at right are the parts of a basket, which will be lined with leaves and used for storing processed manioc



▲ A VILLAGE SCENE at Lake Ipavu. The mothers of infants stay with their babies almost continuously day and night. The spots of *jatobá* resin on the left-hand child are probably for good luck



patting me on the back, but once I must have pushed my welcome too far. I was taking pictures of the women preparing food when one girl began throwing gobs of wet manioc at me. One gob gummed up my camera badly. My first impulse was to withdraw and reconsider my position. But I had made it a rule never to let an Indian stay mad at me for more than 60 seconds. So I leapt back into the fray, making exaggerated protestations of the damage she had done. I removed imaginary manioc from eyes and ears as the second hand worked around toward the finish mark. Then she began to grin, and so did her companions.

A little later I went off into the forest with some of the men to where they were making a dugout. The heat was still extreme, but the glare of the sun was cut off. It was fun to watch the skill and affection with which the chief—not Tah-Koo-Mah's father but one apparently enjoying greater rank in the village—shaped the boat. The blade he used, traded from I know not where, was almost the only metal tool I saw in the village.

Back in the clearing, I prepared my main meal at 4:30 and then examined my patients. Some were improving, some seemed the same.

Around 7:00, I made an unwanted discovery. Each night about this time, as it turned out, the men gathered around the fire and smoked cigars of their own make. After a little of this, I noticed that Tah-Koo-Mah, the only one I could talk with, lost his Portuguese tongue and talked gibble-gabble. I wondered what might be in the cigars and whether smoking one of them would help me to understand more. I tried this, but it only made me care less. The Camayuras are known to grow tobacco, but perhaps they add something. Or perhaps Tah-Koo-Mah was simply entering into

the ceremonial spirit. They had no alcoholic drinks. The evening social and ceremonial life had a strong hold on the men. The women never smoked but sometimes joined the men and sang their own songs.

The noises of the night were a memorable feature of the village. We don't usually realize how hard it is to live from sundown to sunup without light. These people naturally couldn't sleep that long. They can't read, listen to the radio, or visit amusement centers. Primitive people around the world are faced with this problem. The night is too long. At Ipavu, they probably also liked to make a noise to discourage raids from enemy tribes, which are fairly common. The Camayuras, for their part, had captured Tah-Koo-Mah's own mother in a raid on the Suyas. Much of the night, the men shouted, sang, caterwauled, imitated animals and birds, and filled in with forced laughter.

About 3:30 this night, the racket was supplanted by the most haunting flute music I have ever heard. I felt sure that the sickest child was

dying and that they were trying to hold the spirit on earth. So I pulled myself out of my hammock, went to the hut, and made my way through the tiers of hammocks of sleeping Indians, over some and under others, to where the mother was lying with the baby girl. Her fever had remained high, but she was still living, and I gave her another dose.

By now, others were aroused, and I had to visit all my patients. It was hard to climb over and under those hammocks without waking everybody, and I fell flat several times across the body of a startled Indian.

It was chilly at this hour, and when I got back, I was glad to find that Koo-Yah-Yoo had blown the fire until it was crackling brightly. One baby in the hammock with its mother had been awakened by the cold and was whimpering. The mother had strengthened her own fire and was warming the child with her breath. Outside in the moonlight, the fire had gone out under a huge manioc pot. The flute music had died down. The night was silent



➤ **MAKING** a dugout canoe about a mile from the village. The lake was not visible from here but was close enough for the men to carry the boat when it was finished

except for the noises of insects and the unending patting of the feet of the dogs, who seemed to have a running game all their own after the world had gone to sleep. My last memory of that night was a single, loud grunt of a forest pig, followed by barking that never seemed to stop.

Within 24 hours, the temperature of the sickest child was normal, and her mother had bathed and fed her. Only one baby boy still registered 101.5°, and he too seemed to be improving toward the end of my visit with treatments for dysentery and malaria.

My "miracle drugs" aroused only a quiet gratitude in the mothers. Something else, to my surprise, brought a far warmer response. I had been in the village several days and had not thought to say that I liked it here.

"Your village is one of the prettiest places I have ever seen," I told Tah-Koo-Mah, "and I like your people very much!"

He could not conceal his pleasure. Nor could the others to whom I saw him shortly relay the compliment with forced casualness.

The people did not spare themselves in showing me their dances. The most colorful were performed in the daytime, when there was enough light for my color pictures. The women even lost the battle of the manioc, because my telephoto lenses could shoot a scene from farther away than they could throw the stuff. I was able to observe all the activities of the village at this season — hut building, hammock weaving, string making, the making of arrows, the building of a dugout, and — endlessly — the processing and storing of manioc. The people had no drums, but they used a thumping stick on the ground and rattles, which were very effective, and I saw three types of wind instruments: small pan pipes, moderate-sized flutes of bamboo, and huge flutes seven feet long.

I wanted if possible never to make false promises to the Indians, but I got into an embarrassing situation with the common compass.

Colonel Fawcett, I had heard, had made a mistake. He had told the Kalapalos that his compass showed him at any time from which direction he might expect his enemies. The Indians at once coveted an instrument so valuable, and their desire to procure it, together with certain other grievances, led to his murder. So it was with some misgivings that I showed them my compass. It was after sundown one evening when the Southern Cross could be seen. Tah-Koo-Mah told me that they had never seen or heard of such an instrument. I sat down on my folding camp stool with the compass, and the men immediately crowded around. I explained that one end of the needle always pointed to the Southern Cross. The muffled jabbering that went around voiced great curiosity.

"Perhaps you do not believe," I said, "that it will still point to those stars if we go to the other side of the clearing." They fairly dragged me to the other side. But they wouldn't let me show the compass again until the stool had been brought for me to sit on. They talked excitedly when they saw the needle find the Southern Cross. We moved to various points around the village, but each time, the stool had to be put under me before they would let me show the compass.

I then said, "Now I will give the explanation." This was more than they had hoped for. It was also more than I had planned for. Tah-Koo-Mah's brother, who was trying to learn Portuguese, echoed the wishes of the rest by explosively repeating, "*Explicação! Explicação!*"

Alas, I had come to class without my lesson. "The force that pulls the needle is not in the stars but in the earth," I began.

"In the earth," repeated Tah-Koo-Mah, exerting every brain cell.

"It is also in the needle," I went on.

"What force?" asked Tah-Koo-Mah.

"The force is something like electricity," I said. I was only getting in deeper.

It would have been easy to tell

them that the compass had a spirit in it, and they would have understood perfectly. But I let this round go to the Camayuras. The men were disappointed, and they drifted off into the shadows. I took Tah-Koo-Mah aside and asked him to give the compass privately to his father. I never showed seven other compasses I had brought along for trading.

The people of the village enjoyed listening to the voices of the wild Chavantes, which I had recorded on my tape recorder. They were then ready to record their own songs and conversations. They wore the batteries down and almost tore the wires out in their competition to get at the headphones. That wonderful instrument gave me entree among strange people wherever I went.

The ideas of these people seemed to differ mostly from ours in regard to sex and property. It is a mistake to think that people who go naked must act more like animals or that the word "savage" fits them. But I'll say more about this later.

In regard to property, their lives differ from ours in the lack of opportunities to gain prominence or power through wealth. With us, a thousand pressures urge us to buy the car or house or television set that will make our neighbor envious. I'm not sure that these pressures are of themselves bad. Perhaps our judgment and ethical sense develop more vigorously under them. But with the Camayuras, these pressures are almost absent. Each family has its canoe, thatched hut, and implements. No one has gained a sewing machine or an outboard motor for the others to envy. Bows must be traded for hammocks, or pottery for wooden stools. There is no money, and so there is no need to show how much you can buy.

Entering their life, you feel the wall that separates the world of money from the world of barter. People had urged me to leave my money in safe-keeping, but I had carried it, fearing that I might be flown out to a strange city and find myself helpless without cash in

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W. H. Hodge photo

▲ THROUGH THE CENTURIES, travelers have visited the Mexican village of Santa María del Tule to see the great tree. Dying branches recently showed that unless help came, the patriarch's days were numbered

Water for

A Dying Giant

A modern irrigation system comes to the rescue of the famous
Tule Tree, which needs almost 10,000 gallons a day

By ANNETTE H. RICHARDS

ABOUT a year ago, dying branches of one of the wonders of the world, the famous Montezuma Cypress (*Taxodium mucronatum*) in the little churchyard of the small village of Santa María del Tule in the south of Mexico, gave a warning. The more than 2000-year-old pre-Christian giant was literally thirsting to death.

Standing 43 yards high and weighing something like 603 tons, this tree had withstood the attacks of insects and of bark-peeling tourists through all these years, but now it was in mortal danger of dying from drought. The cause of the recent scarcity of water was the installing of wells with pumps near by, which caused the water level to drop drastically.

Without delay, aroused citizens formed the Foundation for the Conservation of the Tule Tree and put on a campaign in the Mexican and American press describing the plight of the ancient tree and suggesting that some kind of well be dug to give it water and preserve its life. To the rescue came three companies — Equipos Mecánicos, S. A., Worthington de México, S. A., de C. V., and Altos Hornos de México, S. A.—which offered to donate a well, a pump, a pump house, irrigation pipe, and the labor to install an irrigation system that would give the tree all its thirsty bulk needed.

Last February, no more than a year after the first agitation on its behalf, the Tule Tree received its

first quenching drink in quite a while. Almost 10,000 gallons a day are drunk by this venerable tree, and there will be no more danger that it will not receive all it needs. By pumping three-quarters of the time, the pump can supply this quantity of water. At commercial rates, the irrigation job would have cost about \$3500.

A well 5½ yards deep was dug 273 yards from the tree, and a three-inch pipe carries the water to the tree at a rate of more than a quart per second. It is distributed to the roots by a perforated pipe set in a circle in a ditch filled with sand, gravel, and fertilizer. A series of about 4 wells will be dug around the tree at a distance of about 50 yards from the trunk so that there will be an accurate gauge of the amount of water the tree needs.

In this way, the tree can be prevented from dying of thirst or, on

the other hand, of suffocating from too high a water level, though cypresses are not very susceptible to that hazard. A fourth company, Guanos Fertilizantes, S. A., donated the fertilizer and will continue to do so.

Though not as old as our American redwoods, this old-timer boasts an enviable age and deserves a little human aid and consideration. And, as a result, it will probably continue for many centuries to awe local citizens as well as the visitors who come from all parts of the world to pay it homage. In contrast to our redwoods, which are tall and slim, this giant tree spreads its bulk horizontally in the form of a monstrous trunk and wide-reaching branches comparatively close to the earth.

Visitors enjoying its generous shade will not see a single trace of the man-made irrigation project.

Annette H. Richards photos



▲ A CROWD GATHERED to witness the inauguration of the irrigation system that is saving the life of the Tule Tree. At right is the cypress; at left, the church in whose yard the pre-Christian tree stands



◀ THE MASSIVE TRUNK of the ancient tree may continue to awe visitors for many more generations, thanks to the irrigation system

Our Largest Petrified Tree

The hardships of desert travel could not prevent two venturesome women from searching out a fossilized forest of giant trees in one of the least-known parts of the United States

By NELL MURBARGER

All photographs by the author



▲ BY NO means the largest of the strange specimens in Nevada's "Stone Forest," but a very beautiful example even so. A climate far different from the arid conditions of today must have nourished this tree. The existing stump is about five feet in diameter. Natural forces caused it to crack neatly into three sections. The piece at lower left is a forty-foot section lying on the ground. The petrified wood is mainly creamy buff in color, handsomely interlined with dark brown and black

"T'S bad medicine," they had warned my companion and me. "It's a place to leave alone!"

That was how men described to us the Black Rock Desert of northwestern Nevada — 10,000 square miles of sun-bleached wilderness, a wild, wind-swept wasteland, barren of water, roads, and supplies.

Undeniably there was a lot of truth in those warnings, but 20-odd years of prowling in the loneliest and most arid sections of the Southwest had given Dora Tucker and me confidence in our ability to meet the desert on its own terms.

Women though we were, we were far from "delicate." Good hikers and experienced campers, we had come to flourish on a minimum of water and food and a maximum of heat and privation. We were determined to see this place. It was like a challenge forever ringing in our ears. We had to see for ourselves exactly how wide and wild was this forbidding realm between Reno and the Oregon line. And we had a reason.

People who heard our plan were sure that we were after the gold and silver that early prospectors had found there or that we were looking for the companion of the fabulous Roebbling Opal, which was found in Virgin Valley and was tentatively valued at a quarter of a million dollars. Not even a pair of women would be foolish enough to enter this devil's stronghold unless



▲ APPROACHING NEVADA'S "Stone Forest" from the south, the traveler encounters other scenes of geologic interest at Pyramid Lake. Now only about 35 miles long, this lake once covered a large area in Western Nevada and neighboring states. The shrinking has occurred since glacial times

they were looking for *something*—something very valuable!

But we had no such objectives. Our quest had begun on a certain blustery day when we were browsing through the stock of a second-hand bookstore in Reno. In a basket of dog-eared volumes, marked to clear at ten cents, we had found a textbook, *An Introduction to Paleobotany*, by Chester A. Arnold. Riffing through the pages of that book, we had come upon the illustration of a fossil tree stump. It was situated, we read, near Leadville, Washoe County, Nevada, and was one of the last remnants of a mighty redwood forest that had flourished in that area millions of years ago.

According to the author's statement, the stump measured 47 feet in circumference. This, we knew, would make it one of the world's largest known petrified trees—possibly the largest of all. The more we thought about this incredible stump, the more fascinating the subject became, until, at last, we developed a consuming curiosity. We were determined to learn if this stump might not have belonged to the deciduous genus *Metasequoia*, or Dawn Redwood, rather than to the genus *Sequoia*, which includes the modern Redwood and Big Tree, as Dr. Arnold, writing a few years

ago, had apparently believed.

Our only clue to the location of our ancient giant was Dr. Arnold's statement that it was situated near Leadville. In any ordinary sort of land, such a clue might be adequate. But this was no ordinary land.

Washoe County has a north-south span as great as the distance from New York City to Washington, D. C. Somewhere in that immensity was a town called Leadville, and somewhere near the town was the petrified tree we sought. But where was Leadville?

That it was not mentioned in the American Guide Series volume on Nevada, sponsored by the Nevada State Historical Society, seemed rather peculiar. Nor was it marked on our road map. Not until we consulted the mining editor of a Reno newspaper did we learn that Leadville is one of those western oddities known as "ghost towns."

The mines that inspired its founding had been closed for many years, and its one-time business houses and homes had fallen into ruin and rubble. It no longer had a single inhabitant. However, if we were determined to visit the place, our informant thought we might reach it by way of Gerlach—a small mining camp between Smoke Creek Desert and Black Rock Desert.



▲ CORAL-LIKE tufa encases boulders, cliff faces, and low-lying islands of Pyramid Lake

"Gerlach is 120 miles north of here," he went on. "You can ask there for additional directions. You ought to find Leadville high in the Granite Mountains about 50 miles north of there."

One hundred seventy miles north of Reno!

An afternoon in early summer found us approaching the southwest shore of Pyramid Lake, and we made our first camp in the shelter of a tufa promontory a short distance back from the water. Making camp was a simple operation for Dora and me. A short trench scooped out of the sand for our fireplace. Camp tables and stools were unfolded, sleeping bags were unrolled on the ground—and presto! We were at home. With our housework out of the way, we set forth for a bit of exploring.

This lake is a particularly interesting body of water. Fed by the sparkling Truckee River, which rises in Lake Tahoe, Pyramid has no outlet. Evaporation that has

been going on since shortly after the close of the glacial age has left its waters definitely brackish, though still clear. Pyramid Lake and Walker Lake 75 miles to the southeast are the last remnants of a great prehistoric body of water known to geologists as Lake Lahontan. Within fairly recent times, geologically speaking, this enormous lake extended from a point south of where Reno is today, northward through Nevada and into portions of California and Oregon, thus covering virtually the entire territory now designated as Black Rock Desert.

This huge lake had been swelled by the melting of North America's great ice sheet. With the disappearance of the glaciers from the highlands of Nevada, it began to shrink. As the climate grew hotter and drier, evaporation exceeded the inflow, and the shore lines of Lahontan receded. Submerged peaks broke through its surface as islands; islands became peninsulas. At last, the great lake was reduced to a few scattered pools of dead water caught in its lowermost depths. Of these entrapped remnants, the largest was destined to become known as Pyramid Lake. Around its shores one sees strange, bulbous knobs, which might remind one on first glance of coral. They are actually boulders encrusted with calcium carbonate, which was deposited by the mineral-laden waters of the shrinking lake.

Sitting in camp that evening, contemplating the still lake, we might have been the last human survivors of a lost world. As far as we could see in any direction, there was not a single house or fence and, but for our own camp, not the faintest sign of mankind.

Barren of shrub or tree, naked and unadorned, the lake lay cradled in a ring of color-splashed desert hills. Out of this pastel panorama rose the dark conical islands—the Pyramids—which gave the place its name. Occasionally our ears caught the muffled beat of wings as a line of white pelicans, a lone California gull, or a cormorant passed over-



▲ A MAN-MADE MARVEL. This erupting cone, three times the height of a standing person, was not here about 30 years ago when a settler drilled for water. What he got was a hot spring, and in the intervening time it has built this enormous and beautifully colored cone

head. As darkness stole across the desert, a few bats came to dip and turn and wheel over our lonely campfire, and the omnipresent cricket began tuning his fiddle for the night. We recalled the tribute paid to Pyramid Lake by Max Miller, noted western writer: "The strangest lake of its size on earth. A lake that cannot possibly be real, unless on the moon!"

Sunrise found us once again on the trail of adventure. Now the surfaced road disappeared and we were on a rough, dusty trail. Eighteen miles farther on we left the lake and found ourselves skirting the fringes of Smoke Creek Desert. Looking upon this terrible vastness, lonely and barren and as dry as mummy dust, we realized that we were in for many grueling

miles of travel. It was nearing noon when we reached Gerlach, a village of only 200 inhabitants, upon whose single dusty street the heat lay like a woolen blanket. The sun was hot. The air we breathed was hot. The white ground underfoot and the metalwork of our car—everything we touched was hot.

We verified the location of Leadville but failed to find anyone who knew of the 47-foot stump on which our hopes were pinned. Several persons admitted, however, that they had heard of a petrified forest "somewhere in the Black Rock."

Leaving Gerlach, we skirted the base of the Granite Mountains, whose barren crest rises 5000 feet above the little mining camp. Scrutinizing the rough, burned canyons, we could not see one green tree, one human habitation, one evidence of water. Eastward, the prospect was even more dreadful. Beyond the narrow band of greasewood that edged our road lay the frightening immensity of the Black Rock Playa—a stark, white world, lacking at this season flowers and birds and streams. Spiraling over the dry lake bed were dust columns, or "sand augers," caused by local whirlwinds. Eight or ten of them would often be visible at one time, and the dust would be carried skyward for as much as 1000 feet, to go reeling and careening across the

land. Heat waves shimmered ahead of us as our car moved over the ancient lake bed. And from time to time we saw the illusion of sparkling water where we knew none could exist.

Twenty-four miles north of Gerlach, Dora drew my attention to a strange dome half a mile east of our road. Shaped like a huge beehive, it baffled our imagination until we were nearly to its base. Then we realized it was a "geyser" cone! It stood three times the height of a man and consisted of hard layers of silica and lime laid down by scalding mineral water, which issued from its top in five streaming jets as shown in the accompanying photograph. The cone was tinted with nearly every color of the rainbow. Maroon and shell pink ranged to the deepest orange and pale ivory, and the whole was enhanced by bandings and stripes of vivid green and jet black. We later learned the curious history of this geyser. A pioneer settler had drilled a well in the hope of locating water for livestock. Instead of gaining what he anticipated, he tapped this near-boiling spring. Virtually uncontrollable, the water has been permitted to spout from the ground unchecked. In little more than 30 years it has built up this fantastic landmark.

Returning to the car, we noticed

a small pond of vile-looking water, apparently formed by the overflow of the hot spring. Our ears were assailed by the shrill screaming of assorted waterfowl and shorebirds. There were herds of killdeer, a few curlews, and several avocets, two of which strove vigorously to distract us from a shallow depression on the bare ground in which their four bluish-speckled eggs lay. And as we turned to go, we saw two pronghorn antelopes—a buck and a doe—on the opposite side of the pond. A second later, they were off with a flash of their white "flags," and almost before we could take a second breath, their incredible speed had carried them over a distant ridge.

As we proceeded northward, we had only a general idea of our location and knew even less of the whereabouts of Leadville. We were therefore especially gratified to glimpse a couple of weathered mine dumps on a mountainside about a mile to the left of the road. Leading toward these was a rutted wagon trail that had seen little use in recent years. Somewhere in that direction, we felt sure, lay the focal point of our quest.

Minutes later we were standing in the heart of a town that had ceased to exist. Where throngs of men once probed the earth in search of silver and lead, not a

▼ THE BLACK ROCK DESERT is not black but shimmering white. It is the gaunt, dark outcroppings of rock, jutting from the surface like the fins of sharks in a

dead sea, that give this desert its name. In dry weather, one can drive anywhere on this ancient lake bed, which is roughly 80 miles long and 30 miles wide



single soul remained. No welcoming smoke curled from the chimneys, and along the street the doors swung on their creaking hinges.

The rutted road led steeply upward toward the mines, and we were surprised to come upon a group of small quaking aspens about a mile above town. As the shadows of afternoon lengthened, we seized upon this pleasant spot as a campsite for the night.

That evening until darkness tell and throughout the next morning we ranged doggedly over the surrounding hills, over endless sweeps of tumbled rock, precipitous ledges, volcanic upheavals, and broken outcroppings. By noon, we admitted that to find one fossil stump in that far-flung wilderness was scarcely within the range of possibility. After eating lunch in the aspens, we decided to return to the road and continue on it northward. It was one of those impulsive, spur-of-the-moment decisions, which once in a blue moon pay off.

Seven miles north of Leadville, I brought the car to an abrupt halt when we came to realize, almost simultaneously, that one of the

countless "boulders" we were passing was not a boulder but a fossil stump!

It was a handsome specimen, about five feet in diameter and eight feet high. On the ground, leading away from the base of the stump, lay a 40-foot section of fossilized trunk. It was predominantly creamy buff in color, handsomely interlined with darker brown and black.

When the first flush of our excitement had worn away, we realized that this was no lone sentinel standing in the wilderness. Other stone stumps speckled the hillside, and the surface of the ground was littered with incalculable tons of shattered trunks and branches and roots, the latter showing a high degree of opalization. We had pinned our faith on a single stump, and blind chance had led us to a whole fossil forest!

Only one who at last tramps the streets of his own "Seventh Heaven" can realize the extent of our delight as we roamed that first afternoon, through the quiet aisles of our stone wonderlands. All that day and the next we were literally lost in a rose-tinted haze of discovery, photographing, measuring, and jotting notes.

The 50-foot steel tape we were carrying revealed several stumps as much as 30 feet in circumference. It was not until nearly evening of the second day, however, that we located the great petrified tree that we subsequently named "The Monarch of the Black Rock."

Situated on the lip of an eroding ravine on the northerly slope of the range, this mighty stump stood 15 feet in height on its downhill side, and as nearly as we could determine by careful measurement its girth was slightly more than 46 feet!

We had no way of knowing if this was the same stump pictured in Dr. Arnold's book—the illustration that had originally sent us on this search. We found no angle from which its profile resembled that in the textbook, but this might be explained by natural deterioration of the stone and erosion of the slope

beneath. Whether it was Dr. Arnold's tree or another, we felt a wonderful thrill to know that here before our eyes stood one of the world's largest known fossil stumps—possibly the largest of all!

Sitting that evening in the flickering light of our dying campfire, my companion and I thought of the great changes that had occurred since these huge trees formed a dark and leafy forest in a cool world of flowing streams and ferns and moistness. Now the land was parched and arid. The brooks were dry. The ferns had vanished, and where timber giants once cast their heavy shade, the largest growth we had been able to find for our evening fire had been the dry and twisted limbs of sagebrush. Great climatic changes had taken place, of that we were certain. But we could not tell whether these trees had been like the existing Sequoias of California or like the Metasequoias—the Dawn Redwoods. It is impossible to distinguish Sequoia wood from that of Metasequoia. However, leaves and cones of Metasequoia are abundant 170 miles to the east, the well-known paleobotanist Dr. Ralph W. Chaney informs us, in rocks of about the same age; so the big stump may well be Metasequoia. The history of both goes back 100,000,000 years, to an era when dinosaurs roamed the earth.

We knew that the Metasequoias had originally grown in some of the earth's most northerly latitudes—in Alaska and northern Siberia, in Spitzbergen, Greenland, and the arctic islands of Canada far north of the Arctic Circle. When climatic changes brought increasing cold to these northern lands, the Dawn Redwoods and other deciduous hardwoods with which it associated were forced into a southerly migration. Down the British Columbia coast the Dawn Redwoods had shifted, into the present states of Washington and Oregon and finally as far east as Montana. But whether the migration of Metasequoia in the western United States carried it as far south as this isolated grove in Washoe County, Nevada, was some-

▼ BRIGHTLY colored samples of the petrified wood from the fossil forest of the Black Rock Desert. Note that the tree rings are still visible in the wood that has turned to stone





▲ LARGEST known tree in Nevada's petrified forest, north of Leadville. This stone giant must have approximated the Coast Redwoods in size. Although shorn of its bark,

the trunk still measures 15 feet in diameter. Note that the width of the trunk extends from where the author is sitting almost to the opposite edge of the photograph

thing that we still hoped to learn.

With our ten-gallon water tank growing too light for our peace of mind, we departed on the morning of our fifth day out of Reno. Continuing northward, we eventually reached Nevada Route 8A and followed it to the small village of Denio, Oregon. Since leaving Gerlach, 3 days and 180 miles back, we had passed through no living town of any size or description, and in all that distance we had met only one vehicle and one human being—a decrepit old truck and its Indian driver. As soon as we reached the post office, we mailed the specimens of our petrified wood to Dr. Ralph W. Chaney at the University of California. We were un-

aware that Dr. Chaney was then engaged in paleobotanical research in India. In his absence, our specimens and request were referred to Dr. Lyman H. Daugherty, of the Department of Natural Resources of San José State College.

Two weeks later our answer came. "The specimen of fossil wood is a *Sequoioxylon*," wrote Dr. Daugherty. "In all probability it is a stump of the trees that produced the fossil leaves *Metasequoia Langsdorffii*. These trees were considered Redwoods until Dr. Chaney discovered that they were either close or identical to the tree recently discovered in China and placed in the genus *Metasequoia*. If you can obtain Arnold's *An In-*

troduction to Paleobotany, you will find a photograph of a large stump on page 6. Arnold called it a Redwood, but when he published the book, he probably did not know about *Metasequoia*. This stump is 47 feet in circumference and was found near Leadville, Washoe County, Nevada. Could this be the same stump you photographed?"

Arnold's *Introduction to Paleobotany* . . . I looked at Dora, and Dora looked at me. Suddenly, we were laughing and remembering a rainy afternoon in Reno and a second-hand bookstore and a dog-eared textbook in a ten-cent bin.

"You know," said my desert-exploring friend, "unless I am mistaken, this is where we came in."



▲ A PET of the animal stamp collectors: *Mephitis chilensis*

YOU'LL never see the world's most popular skunk in a zoo, living wild in the woods, or housebroken as the fond pet of a city dweller. It's found in a number of museums, where it's neither living nor stuffed, and people everywhere clamor for it. Yet it's the darling of men and women and can be yours, too, for less than a half dollar.

This famous American skunk is unique because it's the only one of its kind to be shown on the postage stamps of any nation on earth.

In 1948, the Republic of Chile issued three sheets of postage stamps, honoring the hundredth anniversary of the publication of the first volume of Claudio Gay's *Natural History of Chile*. The book was printed in 1844, but Chile didn't get around to commemorating the event until a few years after the anniversary.

most

Popular Skunk in the world

It was never deodorized, yet it gives off no scent

By FRED KOROTKIN

Three denominations were released. Each sheet of 100 stamps showed 25 all-different flora and fauna designs native to Chile, printed four of each design to the sheet. Appearing on the set were a bat, a praying mantis, and other subjects new to the great fraternity of stamp collectors. The same designs were used for all three denominations: 60 centavos, ultramarine; 2.60 pesos, green for ordinary postage; and 3 pesos, carmine, for airmail.

Some philatelists are enthusiastic about forming specialized collections of stamps portraying subjects of "topical" or thematic interest. They proudly display albums mounted solely with stamps showing animals, birds, butterflies, flowers, maps, ships, sports, bridges, trains, religion, famous people. The list is almost endless.

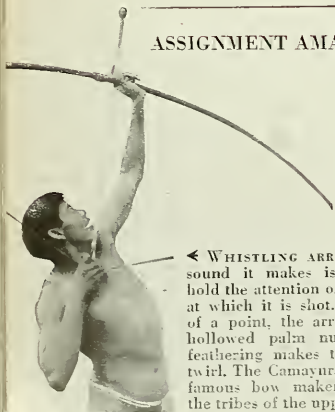
Topical stamps answer the particular interests of collectors very

nically. They can be mounted and displayed in an attention-commanding manner that meets the whims and fancy of the individual. So great is their appeal that the American Topical Association, organized about three years ago, already numbers well over 2000 members.

The skunk stamps became popular overnight with these collectors. When the Chilean sheets were broken up and the stamps sold by subject matter, so many of the skunk design changed hands that dealers today have many left-over stamps with less popular designs.

Many people buy the skunk stamps who don't care one bit about stamp collecting. Mounted on black paper and framed, they take up little room, and the story about them makes interesting conversation. Besides, the complete set of three costs under 50 cents, whereas one living skunk will set you back \$65 if you want one for a pet.

ASSIGNMENT AMAZON *continued from page 463*



◀ WHISTLING ARROW. The sound it makes is said to hold the attention of the bird at which it is shot. In place of a point, the arrow has a hollowed palm nut. Spiral feathering makes the arrow twirl. The Camayunas are the famous bow makers among the tribes of the upper Xingu

pocket. But here it was worthless, and I couldn't have gone far without my trade goods. One of the changes a person undergoes on a trip of this sort is the shift from money-thought to barter-thought.

I had delayed trading in the hope of keeping my bargaining power as long as possible. When I couldn't stall any longer, I drew a line on the ground and showed the Indians that I meant to trade across it. But they wanted another method. I was to show all my things first. The *New*

Yorker recently caught the spirit of this sort of situation in a cartoon, in which one explorer is saying to another, "Does it occur to you that they might be bright enough to realize they can get all this stuff for nothing?" I was in that fix, but I didn't have anyone to talk to about it.

I opened the trading with gifts for the children—bubble pipes, balloons, yo-yos, and the like. For these I didn't expect any return. But I certainly did for the nylon cord,

fishhooks, needles, colored theatrical paint, salt, matches, ribbons, soap, mirrors, and many other articles. The Indians kept asking for more and offering nothing. It looked very much as though they were shaking me down.

Finally, I retired, wondering whether their courtesy covered up a new form of theft. But the articles began to drift in. Flutes, bows and arrows, animal shaped bowls, equipment for processing manioc, and so on. They certainly weren't the shrewd bargainers I had seen in other primitive groups. Perhaps most of the things I brought were so unfamiliar that they were embarrassed about suggesting equivalents. I tied a tag on each object as they gave it to me so that there would be no question whose it was. At intervals all that afternoon they brought me stuff. The next day, when it slowed down, I said: "There is one more thing I want—most of all. One of your beautiful yellow feather headdresses."

"That is impossible," said Tah-Koo-Mah flatly. Had I touched upon a delicate ceremonial matter? I voiced my desire again a little later. His answer shows how much these people live in the moment and how strongly their interest is centered on the matter at hand.

"We can't possibly give it to you," he said, "because we are going to use it today. Come around afterward."

After the dance, I didn't have to ask them for the headdress. They brought it to me and didn't even expect anything in exchange.

I often took a swim late in the afternoon at the foot of the path, 100 yards from the village. Perhaps so she could borrow my soap, Koo-Yah-Yoo would appear from nowhere, shy but sure of herself. Nothing her fellow villagers may have told her made her afraid of me. One afternoon, a man who seemed more worldly-wise than the others, appeared to be joking with her over how dangerous I was. She gave him a look that said as plainly as words, "You take care of your dangers, and I'll take care of mine."



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Weeks later, above the tinkle of ice in a Rio penthouse, some friends wanted me to tell them about these Indians. The wife of a United States General remarked how sad it was to think what the chief's daughter might have been if she could have enjoyed a few of the advantages of civilization. I am not so sure.

She is happy and healthy on the shores of Lake Ipavu. She is in tune with nature and with the society of her fellow men. We imagine that our civilization can do so much to help the people of the wild. Our medical knowledge can; perhaps also some of our ethical philosophy—if we're sure we follow it well enough ourselves. But the before-and-after pictures show that we have not learned through the centuries how to meet native races without hurting them. Why must we remake them in our own image! We insist on putting clothes on them, which a day later are dirty and unsanitary. Diseases that are not usually serious with us kill or cripple them in great numbers. They lose their own culture and the pleasure of their traditions, and we give them little beyond the chance to become second-class citizens.

Civilized people, I suppose, are people who wear clothes. On that basis, you would be tempted to call these people savages, because the complete outfit of the well-dressed debutante on Lake Ipavu weighed one-twentieth of an ounce. Yet I wondered who is civilized, we or they. So far as I could see these naked natives didn't have any equivalent of our low humor, and they showed nothing in their entertainment patterns like our emphasis

on sex. Perhaps they would not call us exactly proper. But that should be no excuse for us to call them immodest. They were charmingly modest about their workmanship and cooking. What they lacked was shame, which is one of civilization's first gifts. I am not saying that everyone ought to go naked or that these Indians are perfect. Sometimes they even kill people. But I cared too much about what they thought of me to describe an atom bomb to them.

I had begun by distrusting these people, and I ended by being flattered beyond words when the chief and others asked me four times whether I would visit them again.

The last time I saw Koo-Yah-Yoo, I passed her on the trail outside the village, where I had gone for a stroll at sunup before leaving. She was going out and I was coming in. A glance passed between us, and she gave me her fleeting smile. She was saying goodbye to the strange white man. I was saying goodbye to the World of Yesterday.

Koo-Yah-Yoo may never see a Cadillac or a Bendix, but one has to have more faith in civilization than I do to wish her all our so-called advantages, including a husband who might leave her for a global war or exhaust himself seeking a security she wouldn't understand and striving to regain freedoms she never lost.

But we'll make these people over. Just you watch!

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- where you can go fishing all year round; where you can go hunting, boating, swimming, and always have a good time;
- where your hobby will bring you an income;
- where you stand the best chance of living longer;

You'd spend months, plus hundreds of dollars if you searched for the hundreds of facts in this book by traveling around the country. But all these facts on little known beauty spots, America's favorite retirement areas, and many undiscovered towns, cities, and regions, are yours for just \$1.

Sooner or later—now in years to come—you want to be independent. Order today, while you think of it. Money back, of course, if you're not satisfied.

Don't bother writing a letter. Use coupon to order.

Bargain Paradieses of the World

Do you know where to find an island right near the U.S. so nearly like Tahiti in appearance, beauty, and color even the natives say it was made from a rainbow? (And that costs here are so low you can not only reach it but also stay a while for hardly more than you'd spend at a resort in the U.S.) Do you know where to find the world's best mountain hide-aways or its most dazzling surf-washed coastal resorts, where even today you can live for a song?

Do you know where it costs less to spend a while, the sure pleasures, and the climate well high perfect in such places as Guatemala, Mexico, the West Indies, Peru, France, along the Mediterranean, and in the world's other low cost wonderlands?

Or if you've thought of more distant places, do you know which of the South Sea Islands are as unspoiled today as in Conrad's day? Or which is the one spot world travelers call the most beautiful place on earth, where two can live in sheer luxury, with a retinue of servants for only \$1 a month?

Bargain Paradieses of the World, a big new book with about 100 photos and 4 maps, proves that if you can afford a vacation in the U.S., the rest of the world is closer than you think. Authors Norman D. Ford and William Redgrave, honorary vice-presidents of the Globe Trotters Club, show that the American dollar is respected all over the world and buys a lot more than you'd give it credit for.

Yes, if you're planning to retire, this book shows that you can live for months on end in the world's wonderlands for hardly more than you'd spend for a few months at home. Or if you've dreamed of taking time out for a real rest, this book shows how you can afford it.

In any case, when it can cost as little as \$24.50 from the U.S. border to reach some of the world's Bargain Paradieses, it's time you learned how much you can do on the money you've got. Send now for **Bargain Paradieses of the World**. Price \$1.50. Use coupon to order.

Where Will You Go In Florida?

If You Want a Vacation You Can Afford?

Florida needn't be expensive—not if you know just where to go for whatever you seek in Florida. And if there's any man who can give you the facts you want it's Norman Ford, founder of the world-famous Globe Trotters Club. (Yes, Florida is his home whenever he isn't traveling!)

His big book, **Norman Ford's Florida**, tells you, first of all, road by road, mile by mile, everything you'll find in Florida, whether you're on vacation, or looking over job, business, real estate, or retirement prospects.

Always, he names the hotels, motels, and restaurants where you can stop for the best accommodations and meals at the price you want to pay. For that longer vacation, if you let Norman Ford guide you, you'll find a real "paradise"—just the spot which has everything you want.

Of course, there's much more to this big book.

If You Want a Job or a Home in Florida

Norman Ford tells you just where to head. His talks with hundreds of personnel managers, business men, real estate operators, state officials, etc., lets him pinpoint the towns you want to know about if you're going to Florida for a home, a job with a future, or a business of your own. If you've ever wanted to run a tourist court or own an orange grove, he tells you today's inside story of these popular investments.

If You Want to Retire On a Small Income

Norman Ford tells you exactly where you can retire now on the money you've got, whether it's a little or a lot. (If you need a part-time or seasonal job to help out your income, he tells you where to pick up extra income.) Because Norman Ford always tells you where life in Florida is pleasantest on a small income, he can help you to take life easy now.

Yes, no matter what you seek in Florida—whether you want to retire, vacation, get a job, buy a home, or start a business, **Norman Ford's Florida** gives you the facts you need to find exactly what you want. Yet this big book with plenty of maps and well over 100,000 words sells for only \$2—only a fraction of the money you'd spend needlessly if you went to Florida blind.

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TWO SCENES from the United Artist's version of Captain John Smith and Pocahontas—both in the camp of Pocahontas's father



The Screen

Authentic comments on films

in the field of nature, geography, and exploration

*"Captain John Smith
and Pocahontas"*

Reviewed by Ethel Cutler Freeman

Edited by ELIZABETH DOWNES

THE title, "Captain John Smith and Pocahontas," encouraged us to believe that some lucky writer had unearthed the enthralling accounts of the first Virginia colony left us by two authors, Captain John Smith himself and John Rolfe, the English husband of Pocahontas.

Unfortunately, Aubrey Wisberg and Jack Pollexfen, the authors and producers, seem to have missed this source material. In this film, the life and hardships of the first settlers in Jamestown are unimaginatively portrayed. The usual racing Indians, cat calls, gun fire, naked skin, and flashing knives lead up to the shop-worn incident of Smith's rescue by Pocahontas.

Historically, the picture is correct except for a few discrepancies. To create love interest and suspense, John Rolfe, (Robert Clarke) is represented as a contemporary rival of Smith's. In reality, Rolfe married Pocahontas six years after Smith's return to England in 1607. Pocahontas was a prisoner of the English and had already become a Christian and changed her name to Rebecca, when Rolfe met her in 1613. Also it was Pocahontas's marriage to Rolfe and not to Smith, that was responsible for the eight years of peace between the Indians and the Whites that helped establish the colony at Jamestown.

"A Modern Version of the Story of John Smith and Pocahontas" would be an appropriate name for the picture. Judy Lawrance plays Pocahontas, called by the Indians, "The Playful One," as though she were an introspective, sophisticated woman masquerading as an Indian, not the thirteen-year-old daughter of Chief Powhatan. Nor did Anthony

Dexter depict John Smith as the fascinating, swaggering dare-devil explorer and adventurer of 350 years ago who boasted of loving and leaving many women, even the Turkish Pasha's wife. Dexter's smart, immaculate clothes designed to display his fine physique would have been more suitable for a shooting box in Scotland than fighting the Indians.

Perhaps sometime some producer will give us the story of John Smith's life as he told it, although controversy rages as to the veracity of his tall tales. Even the Pocahontas episode is doubted, for not until Rolfe took Pocahontas to England

and she was presented to the King and Queen and entertained by the Bishop of London, did Smith, who loved the lime-light, come across with the story of the then famous Indian maid's having saved his life.

Smith was a soldier of fortune for six years. He traveled all over Europe, explored Virginia, held office there, and later went to New England. His vivid descriptions of people and their customs are considered authentic, although he may have been a Baron Munchausen as far as some of his hair-raising adventures are concerned.

Brief comments on films previously reviewed

Documentary and Grade A

Below the Sahara

African wildlife film made on location

What the Experts Said

Interesting sequences of African fauna and native peoples. Authentic flavor

The Living Desert

Disney's first feature-length True-life Adventure film, showing animal and plant life in the Great American Desert

Marvels disclosed in this film must be seen before one can sense full significance

Tanga Tika

A story attempting to portray present-day Polynesian life.

Takes an anthropologist to understand fully what the film is trying to do. Beautiful photography

Down the Alphabet

Mogambo

Clark Gable as animal collector in Africa. Simple plot

Not truly Africa, although partly filmed on location. Gorilla action climax of film

Discover the Kodak Duaflex Camera, *f/8*

Here's a camera that upsets some old notions about cameras and picture making generally. It makes a good gift, certainly. Just possibly you'll want it for yourself. Here's the full story.

Maybe you are a bit snobbish about cameras. Normally, maybe, you wouldn't think of the Kodak Duaflex Camera, Kodar Model, for your own use. After all, it's priced under \$25.

But take another look—a good one—for here's a camera that upsets all the rules.

It's good optically. It's good mechanically. It's good-looking. It handles well. It handles simply. It forestalls errors. It's fun to use. It lets you see what you're getting—*clearly*. It allows you to concentrate on your subject—not on twiddling scales and reading dials. It capably covers a wide range of subjects and situations. Its lens is the right speed for the majority of outdoor and flash shots. Its negatives are sharp and clean. It leaves you free to have a good time, planning and taking pictures—and its very simplicity poses a challenge, brings back the old zest to your hobby.

No matter what cameras you own now—no matter what you paid for them—you'll get more enjoyment from photography if you also own a Kodak Duaflex Camera, Kodar Model, with *f/8* lens.

You're In Good Company

Kodak is still in process of discovering how good the Duaflex *f/8* is—and so are many others.

Here, for example, is a famous photographic illustrator. For his pro-

fessional work he uses the most expensive cameras and lenses money can buy. For his personal photography—a Kodak Duaflex *f/8*. How did this happen? He *tried* one.

And here's a hobbyist who writes to Kodak—so enthusiastic about the Duaflex *f/8* that he owns *three* of them! One for each of his three favorite films, Kodak Super-XX, Kodacolor Daylight Type, and Kodacolor Type A.

Why Such Enthusiasm?

It's easy enough to make an inventory of this camera's features (as we've done at the right). But that won't give you the full story. You've got to pick up its capable 14 ounces . . . loop its strap over your neck . . . cradle it in your hands . . . look down into that big, beautiful finder . . . feel the essential *rightness* of each detail. You've got to take a series of pictures, and enjoy the satisfaction of a camera that's full of performance—yet doesn't tie you up in mathematics and scientific problem-solving.

And when you fall in love with this little camera—when you find you're taking a lot more pictures, and having a lot more fun in the taking—don't say you weren't fairly warned.

EASTMAN KODAK COMPANY Rochester 4, N. Y.

P.S.—The Kodak Duaflex *f/8* makes a grand gift, to start your wife or child in photography. But get two of them, at the start—so you won't be borrowing all the time.

Here's why you'll enjoy a Kodak Duaflex *f/8*

● Let's start at the top and work down. Here's a big hooded reflex finder, 1 1/4 inches square. Look down into it. Brilliant. Crystal-clear. Easy to use if you wear glasses, or if you don't. Every detail of your picture, accurately previewed.

● Next, a shutter without problems. Two settings—one for snapshots, one for longer exposures. Self-setting—no cocking to remember. And adequate speed not only for all quiet subjects, but also for moderate motion if you know your action technique.

● And here, a lens that belongs on a more expensive camera. Not a simple meniscus, not a doublet, but a sharp-cutting three-element objective, amply corrected for all the common optical errors, and for color. Aperture, *f/16* to *f/8*—the biggest slice of useful speed on a roll-film camera, plus excellent quality, at a minimum price.

● Built-in flash synchronization, of course.

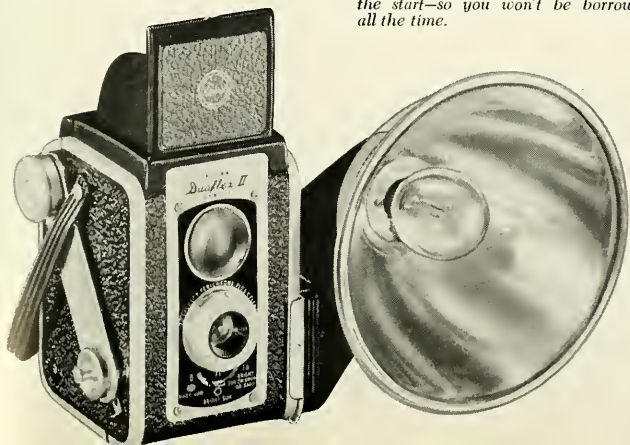
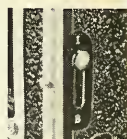
● And an aperture scale that talks: *f/16*, bright sun on snow or sand; *f/11*, bright sun; *f/8*, hazy sun. No guides to check; data right on the camera.

● And focusing—infinity down to 3 1/2 feet. Any better range, for distant and close work, on any of your more expensive hand cameras?

● Here's a double-exposure prevention device. This, you'd expect only on a precision miniature or a top-price reflex. And you can make deliberate double exposures at will.

● And some details. Tripod socket. Camera stands level on a level surface. Body is of metal with tough milled side panels, handsomely leather-grained, and edges metal-bound. Weight, about 14 ounces. And the price, \$22.30, including neck strap. Accessory Flash-older, \$4.25. Field case, drop front, \$2.65. Lens accepts all Series V filters, Portra lenses, etc., with 1 1/4-inch adapter ring.

Prices include Federal Tax and are subject to change without notice.



Kodak
TRADE-MARK

Monsanto reports:

New development puts more "rise" in self-rising flours and baking mixes



WHEN DOES A BISCUIT MAKE NEWS? When it rises higher every time! When it bakes whiter, lighter and more flavorful. That's the kind of biscuit any homemaker will bake any time she uses self-rising flour containing Py-ran, Monsanto's new phosphate leavening agent. Py-ran has a special absorbent coating that times the rise, starts expanding the biscuits and cakes after they enter the oven. As the dough is baked, Py-ran gently, smoothly expands the batter to light, firm, even texture. Mrs. Homemaker will love to bake with her favorite brands of self-rising flours and prepared cake mixes. They can be even better now, with Py-ran, Monsanto's newest phosphate leavening agent for the milling industry.

Py-ran: Reg. U. S. Pat. Off.



PANCAKES that are light, tender and fine-grained can now be baked from pancake mixes containing Py-ran and Monsanto HT phosphate.



PICTURE-CAKES are a modern-day wonder when Py-ran and its companion phosphate, Monsanto SAPP, are used in prepared cake mixes.



DOUGHNUTS are now more delicious than ever. The special phosphate leavening agent, SAPP-40, helps make doughnuts light and easily digested.

DECEMBER



PY-RAN helps assure consistently good baking results from the first biscuit to the last.

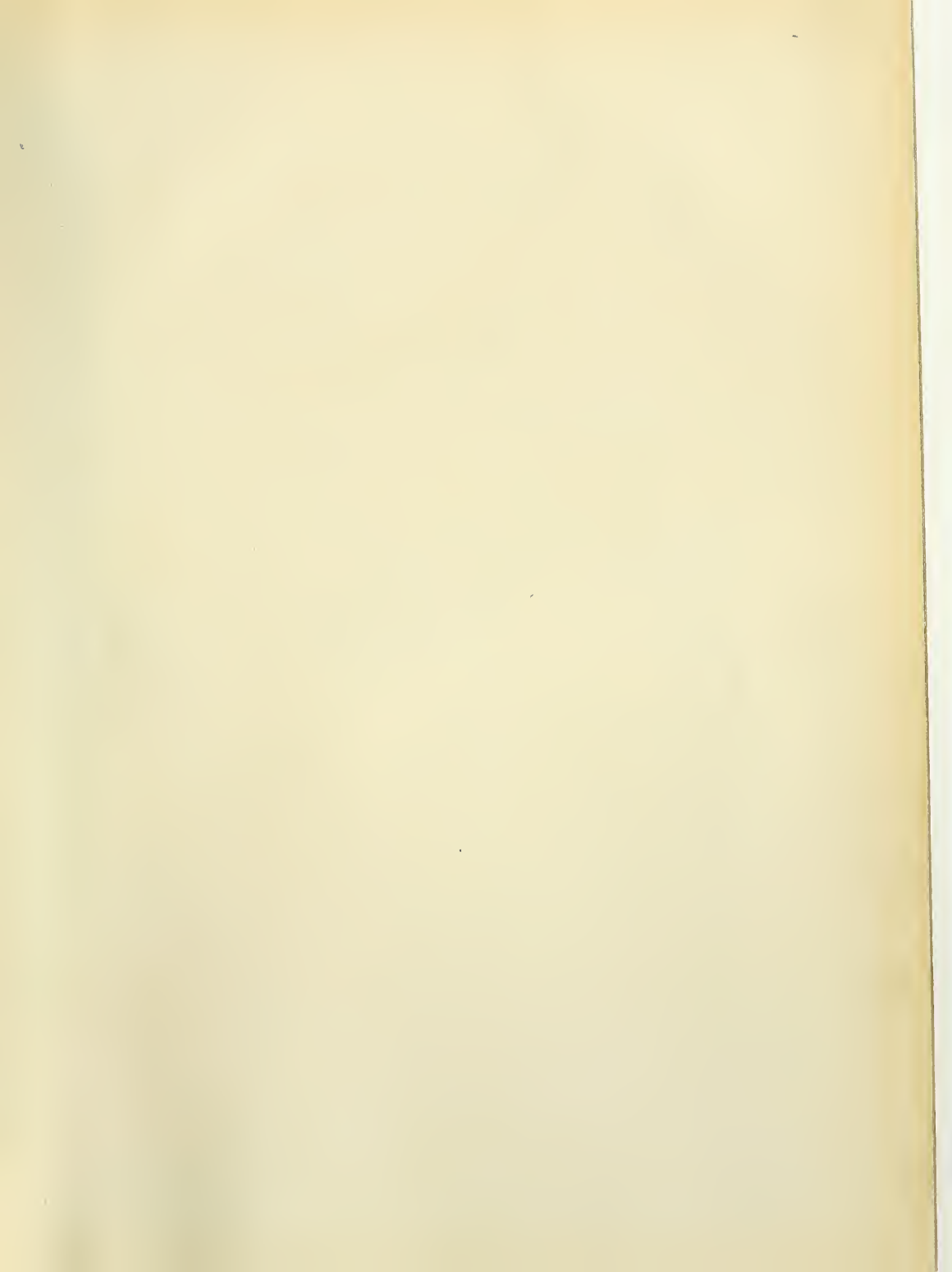
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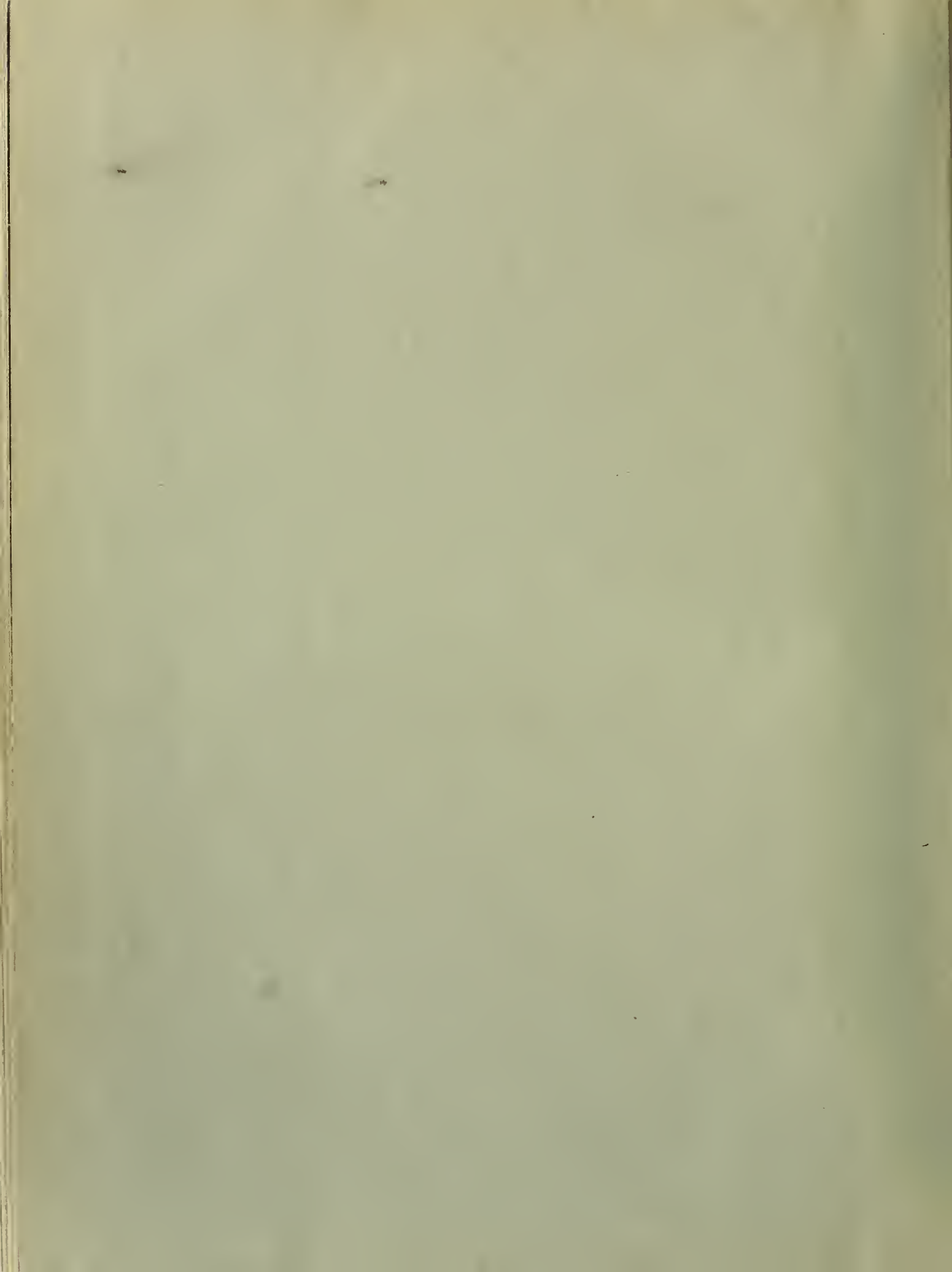
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MILLERS: If your Monsanto representative has not yet given you the complete report on Py-ran, please contact Monsanto at once.







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